12 Occasional Papers in Archaeology and History No. 12
Contributions from the Fortress of Louisbourg—No. 2

Canadian Historic Sites

Indian and Northern Affairs

Affaires indiennes et du Nord

Issued under the authority of the Honourable Judd Buchanan, PC, MP, Minister of Indian and Northern Affairs

Produced by the Conservation Group, Office of the
Public Information Adviser
Design: Gottschalk+Ash Ltd.
Editor: Katherine Bennett

Canadian Historic Sites: Occasional Papers in Archaeology and History will be published as papers become available. Manuscripts may be submitted to Chief, Research Division, National Historic Parks and Sites Branch, Indian and Northern Affairs, Ottawa, Ontario K1A 0H4, Canada.

5 **Lime Preparation at 18th-Century Louisbourg,**
by Charles S. Lindsay

47 **Louisbourg Guardhouses,**
by Charles S. Lindsay

101 **A Survey of Louisbourg Gunflints,**
by T. M. Hamilton and Bruce W. Fry

Canadian Historic Sites:
Occasional Papers in Archaeology and History – No. 12

National Historic Parks and Sites Branch
Parks Canada
Indian and Northern Affairs
Ottawa, 1975

Cover: Place d'Armes guardhouse in the King's Bastion.

© Crown Copyright reserved
Available by mail from Information Canada,
Ottawa, K1A 0S9 and at the following Information
Canada bookshops:

Halifax
1683 Barrington Street

Montreal
640 St. Catherine Street West

Ottawa
171 Slater Street

Toronto
221 Yonge Street

Winnipeg
393 Portage Avenue

Vancouver
800 Granville Street

or through your bookseller

Price Canada: $5.00; Price other countries: $6.00
Catalogue No.: R61-2/1-12
Library of Congress Catalogue Card No.: 70-103875
Price subject to change without notice.
Information Canada
Ottawa, 1975
IAND Publication No. QS-1456-000-EE-A1

Lime Preparation at 18th-Century Louisbourg

by Charles S. Lindsay

Canadian Historic Sites
No. 12

6 **Abstract**
6 **Preface**
6 **Lime Preparation in France**
6 Limestone
7 Lime-kilns
9 *Flare Kilns*
12 *Running Kilns*
15 Slaking
17 **Introduction to the *Faubourg* Lime-kilns**
17 The Site
17 History
21 **The First Kiln**
21 The Kiln
24 The Passageway
24 Banks
26 Conclusions
26 **The Second Kiln**
26 The Kiln
26 Drawholes
26 *The North and West Drawholes*
29 *The Southeast Drawhole*
30 Passageways
30 *The North and West Passageways*
35 *The Southeast Passageway*
35 The Floor
36 Conclusions
36 **Other Lime-kilns at Louisbourg**
40 **Slaking at Louisbourg**
42 **Limestone used at Louisbourg**
43 **Endnotes**
44 **Bibliography**

Illustrations

7 *1 Eighteenth-century French lime-kilns.*
8 *2 An idealised flare kiln.*
9 *3 Flare kilns from various regions of France.*
11 *4 A flare kiln from Alsace.*
13 *5 A running kiln from Flanders.*
14 *6 Running kilns from various regions of France.*
16 *7 Plan and cross-section of slaking pits.*
18 *8 1757 plan of the* faubourg *showing the lime-kiln.*
19 *9 Plan of the* faubourg *lime-kiln.*
20 *10 Section through the* faubourg *lime-kiln.*
21 *11 General view of the* faubourg *lime-kiln after excavation.*
23 *12 Section along the southeast passageway.*
25 *13 Wooden drain.*
27 *14 The north drawhole from inside the second kiln.*
28 *15 The west passageway, alcove and drawhole of the second kiln.*
30 *16 The southeast drawhole of the second kiln.*
31 *17 Iron bands supporting the arch of the west drawhole.*
32 *18 Brick springer of the arch over the breach of the west drawhole.*
33 *19 Part of the wooden floor of the west passageway.*
34 *20 Section through the west passageway.*
35 *21 The floor of the second kiln.*
37 *22 Distribution map of lime-kilns and slaking pits at Louisbourg.*
38 *23 Historical drawings of lime-kilns at Louisbourg.*
40 *24 Remains of the excavated lime-kiln west of Block I.*
41 *25 Historical drawing of slaking pits at Louisbourg.*

Abstract
The equipment and techniques used in the preparation of lime for mortar in 18th-century Louisbourg are studied against the background of contemporary practices in France. Two basic types of French kilns and lime-burning techniques are identified, as are two methods of slaking the burnt lime. Parallels for all these structures and techniques are found at Louisbourg.

Submitted for publication 1971, by Charles S. Lindsay, National Historic Parks and Sites, Ottawa.

Preface
Eighteenth-century methods of lime preparation were researched after excavation in 1968 of a double-kiln complex in the *faubourg* or suburb outside the fortress of Louisbourg because the structure presented a number of unexplained features. The first section of this paper deals with 18th-century kilns, limeburning practices and the slaking of burnt lime in France. The major part of the paper is concerned with the excavation of the double-kiln complex in the *faubourg*, and the remainder considers lime preparation at Louisbourg in general.[1]

Preliminary historical research prior to excavation was carried out by Linda Hoad, to whom much of the credit should also go for suggesting further sources of information. The photographs and drawings are the work of the graphics unit. Over-all supervision was by Bruce Fry, then Senior Archaeologist at Louisbourg. To all these people much gratitude is due.

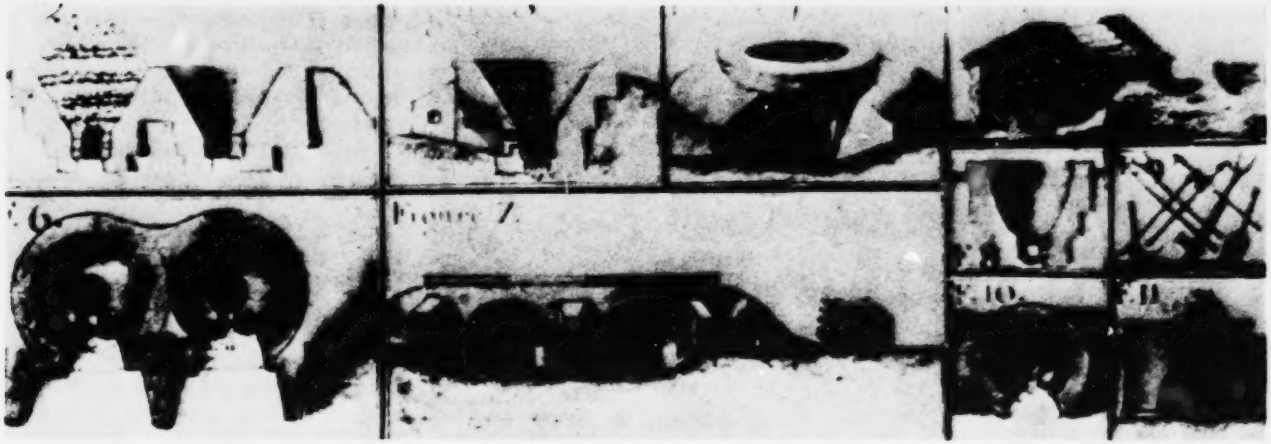
Where measurements given in the text are from 18th-century French sources the contemporary system of *pieds* (1.006 ft.) and *pouces* (1.066 in.) is retained. All other measurements are given in feet.

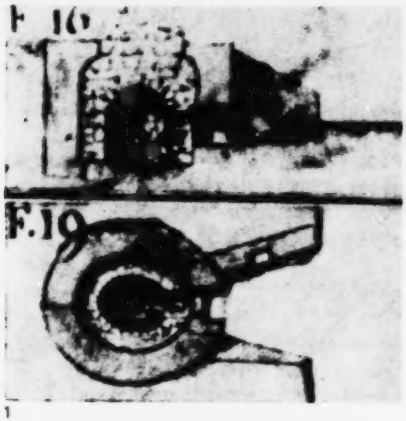
Lime Preparation in France
Limestone
Limestone, when considered as a constituent of mortar, is classified on the basis of its ability to set under water. That which will set produces "hydraulic lime" and contains more than 10 per cent alumina and silica impurities. That which will not set, "non-hydraulic lime," contains less than 10 per cent of these elements. In general, non-hydraulic lime is obtained from chalkbeds and oolitic limestones, and hydraulic lime is obtained from argillaceous, siliceous, carboniferous and lias limestones.

In the 18th century, however, limeburners, being generally uneducated in the chemical composition of their raw materials, classified limestone on the basis of its hardness. The darker and harder the stone, the better lime it produced when burnt. However, the softer beds of stone and the upper, less well-compacted beds were often used because they were easier and cheaper to quarry.

To change the limestone into a form suitable for use in mortar it must first be burnt, which drives out the carbon dioxide ($CaCO_3 + \text{heat} = CaCO_3 - CO_2 = CaO$). The result is quicklime, which is then slaked with water to form calcium hydroxide or hydrated lime ($CaO + H_2O = Ca[OH]_2$) which, when mixed with sand to make mortar, loses water through evaporation during setting ($Ca[OH]_2 - H_2O = CaO$) and absorbs carbon dioxide from the atmosphere ($CaO + CO_2 = CaCO_3$) whereby the cycle is completed and the finished product returns to limestone.[1]

1 Eighteenth-century French lime-kilns (Figs. 2-11, 16, 19) illustrated by Masse. Described as "king's kilns," they purportedly are drawings of actual existing structures. *(Bibliothèque du Génie.)*





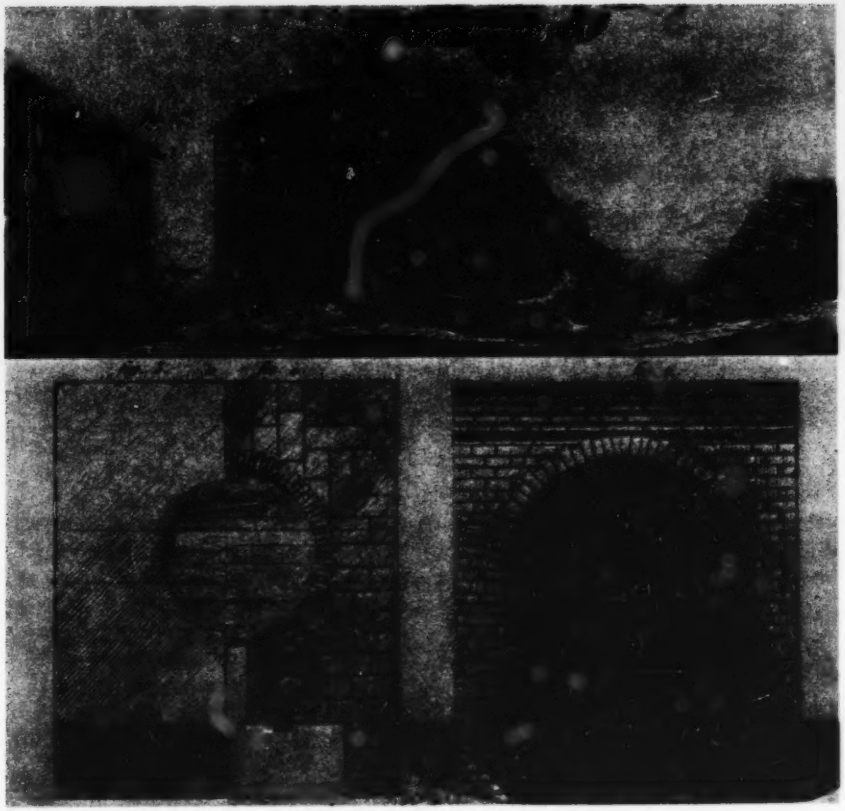
1

Lime-kilns

Lime-kilns, where the quarried stone was taken to be burnt to form quicklime, were a common feature of the landscape in the 18th century, both in limestone regions and in areas where building was taking place. Such a ubiquitous type of structure inevitably manifested itself in many forms, the variations being the product of regional styles, different methods of operation, the relative longevity intended for the kiln and the varying skills and knowledge of the builder.

A few sources of detailed information on the subject of lime-kilns and their operation have survived from the 18th century. The most comprehensive is a work entitled *L'Art du chaufournier* written by Fourcroy de Ramecourt in 1766. This work deals in detail with the design, operation and economics of lime-kilns, mainly along the northeastern and eastern borders of France. The illustrations are plentiful, detailed and well described. Diderot's *Encyclopédie* contains an article on a "flare" kiln in volume 3, published in 1753, which was copied verbatim by de Ramecourt with the comment that he had never seen such a kiln and that it was probably an idealised version of a type that existed in the Ardennes. In 1766, Diderot returned the compliment by copying a section on a "running" kiln from de Ramecourt and publishing it verbatim in the second volume of the supplement to the *Encyclopédie*. A third source of information is an illustration of several types of lime-kilns attached to a treatise on military construction written by the French engineer, Masse, and found in the archives of the Corps of Engineers.[2] This treatise, published in 1728, has little to say about lime-kilns, but the illustrations are useful since they purport to be of actual examples of lime-kilns existing in various regions of France.

2 An idealised version of a flare kiln having a sub-floor air channel. *(Encyclopédie, s.v. "Agriculture et Economie Rustique, Four à Chaux.")*



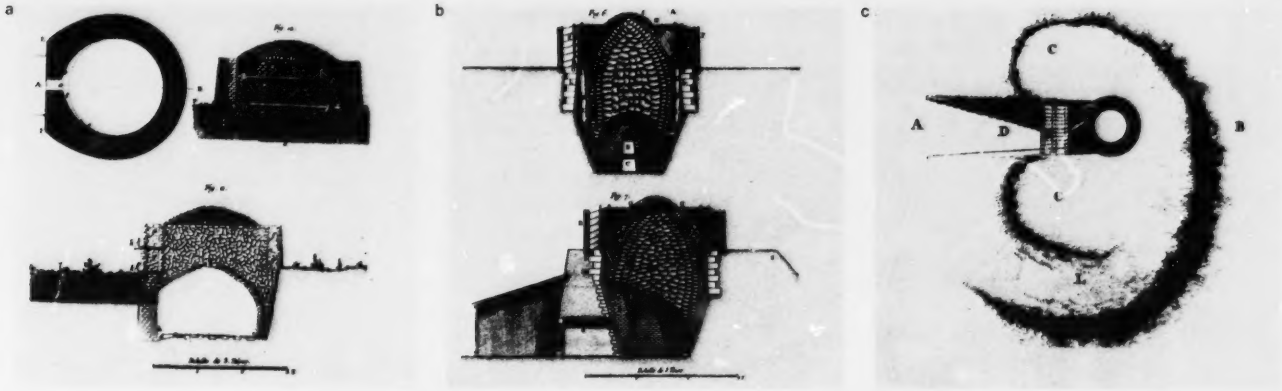
2

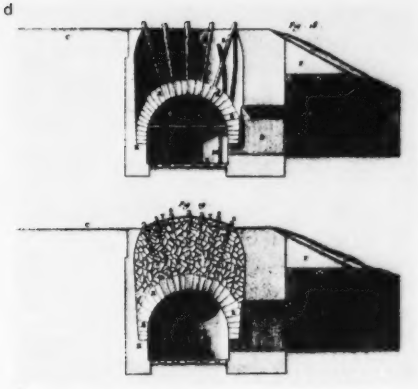
A later source of information is *Traité sur l'art de faire de bons mortiers* by Raucourt de Charleville. Although this work was not published until 1828 and therefore contains some elements of design and operation that were not known in the 18th century, it is very useful for the detailed descriptions of the operation of kilns and the selection of fuels. The anonymously authored *Architecture rurale* published in 1820 also has a few useful comments on the subject of lime-kilns.

Although there were numerous variations in design of kilns, they were grouped in two types by most writers. The first type, known as *grande flamme* or "flare" kilns, had a fire set on the floor beneath an arch or dome supporting the load of limestone. The heat from the fire penetrated between the stones to calcine them, without any direct contact between fire and stone. When the load was burnt the kiln had to be cooled before the lime could be removed. The second type of kiln, *petit feu* or "running" kiln (equivalent to a draw-kiln), was loaded with alternating layers of limestone and fuel and had openings around the base to draw off the burnt lime. The fire was set at the bottom and gradually worked its way up through the load. As the lower layers were calcined, they were drawn off at the bottom and the upper layers sank lower into the kiln. The gap at the top was filled with fresh layers of stone and fuel, thus creating a continuously operating kiln. This type of kiln had the obvious advantages of mass production, but also some of its disadvantages, since the intimate contact of fuel and stone produced a dirty quicklime compared with the product of a flare kiln.

The location of a kiln depended on the relative cost of three elements: transport of limestone, transport of quicklime and transport of fuel. Because of this interdependency, kilns were to be found either at the limestone quarry, near the building site, or occasionally near a coal or wood source. According to de Ramecourt, the kilns of the Rhône valley were situated at the spot most convenient to the quarry, whether or not the best lime had already been removed.[3] On the other hand, the limeburners of Provence were semi-nomadic, setting up their kilns wherever there was an immediate market and carrying their fuel with them due to the scarcity of wood in that part of France. One

3 Flare kilns from *a*, Provence; *b*, Lorraine; *c* and *d*, Champagne. *a*, *b* and *d*, illustrate various methods of loading flare kilns; *c*, shows in plan the common practice of building the kiln into the side of a hill (C) with a ramp (L) for access to the top. *(Fourcroy de Ramecourt, L'Art du chaufournier* [Paris: n.p., 1766], *Pl. 3, 4, 5, 6.)*





3

effect of this nomadism was that the limeburners, who often quarried their own stone, used only the upper beds which were soft and easily calcined. Unfortunately, these limestones expanded much less than most when slaked; as a countermeasure a law was passed in Provence compelling the limeburners to sell their lime already slaked.

Flare Kilns

The simplest form of flare kiln was described briefly by Diderot.

There are areas where they merely make holes in the ground and arrange the pieces of limestone next to each other; they make a mouth and a chimney and cover the holes and stones with puddled clay; they light a fire in the centre which is maintained for seven or eight days and when no more smoke or steam is given off the lime is supposed to have been burnt.[4] [Translation.]

The obvious cheapness of such a kiln was its main attraction to individuals who required perhaps only a single batch of lime. However, the saving in construction costs was partly offset by the lack of control in the operation of such a kiln and the likelihood, therefore, that much of the limestone would emerge uncalcined.

The more sophisticated flare kilns were often subterranean except for the top of the wall. Such kilns were often built into the side of a hill (Fig. 3,*c*) or reinforced with banks of earth. Sometimes free-standing kilns were built, but the expense of constructing very thick walls was prohibitive.

Most flare kilns were circular with a cylindrical interior, though some tapered slightly toward the base (Fig. 3, *b*). In the late 18th, and 19th centuries, the interior form of these kilns was gradually modified to an egg-shape truncated at top and bottom (Fig. 2). Bottle-shaped kilns with constricted openings at the top were also known in the 18th century, one being illustrated by Diderot.[5] These shapes resulted in less heat loss at the top.

The walls of these kilns were usually one or two *pieds* thick. The author of *Architecture rurale* stated that the thickness of the walls should be one-fifth the diameter of the kiln.[6]

Other writers contented themselves with noting that the walls should be strong enough to withstand the heat of the fire.

Diderot's idealized kiln had a base 12 *pieds* square, and an oval kiln above, 9 *pieds* in diameter at the widest point inside. De Charleville noted that the bigger the kiln, the more expensive and difficult it was to construct. The internal diameters of de Ramecourt's kilns ranged from 6 *pieds* to 15 *pieds*, though he recommended that smaller ones be built. The Masse illustration (Fig. 1, *16*) showed a flare kiln 11 *pieds* in diameter, but the accompanying text explained that these drawings were of kilns in use by the general populace while those used in the king's works were bigger and often found in groups of two, three, four or six.[7]

The best material for building kilns was brick, but this was expensive and most kilns were constructed of whatever stone was available. The most durable stones were granite and flint, but other hard stones such as sandstone were adequate. De Ramecourt recommended that mortar should not be used in those parts of the kiln exposed to the heat of the fire,[8] but rather clay mixed with water (puddled clay). De Ramecourt also noted that in Provence, kilns were lined inside with well-beaten clay to protect the masonry.[9] Others were lined with brick.

In Diderot's idealized kiln there was a stone-lined channel running beneath the floor of the kiln to supply air to the fire through holes in its arch (Fig. 2). Diderot called this an *ébrasoir*. De Ramecourt recommended that more kilns should have such a flue, but by 1820 when *Architecture rurale* was published, it was noted that all the simpler kilns still lacked this feature.[10] The Masse illustrations, drawn in 1728, do not show this flue on any kiln, so one may assume that its introduction came later, and its widespread adoption did not occur until the 19th century.

The flare kiln was loaded so as to leave a gap at the bottom for the fire. In Provence this was done by selecting flat stones for the construction of a corbelled dome (Fig. 3, *a*). In Champagne, large stones were selected and placed radially on a dome-shaped mass of fagots supported on stilts (Fig. 3, *d*). Once the fire was started, the stilts would burn away, but by that time the weight of the limestone had stabilized the arch.

With the dome in place, the remainder of the kiln could be loaded. Usually the larger pieces were placed near the centre and the smaller ones near the edge. This distribution achieved two purposes. First, the larger stones, being nearer the fire, were more easily calcined through to their cores, and second, since this arrangement tended to leave larger gaps between stones, the heat circulated more easily through the kiln. In some kilns the heat was further distributed by means of vertical chimneys which consisted of wooden logs set upright in the mass of stones (Fig. 3, *d*). These quickly burnt out and created flues to draw the heat to the top of the kiln.

Extreme care was necessary during the firing to achieve an even degree of burning throughout the whole load of stone. Too much heat in one place could turn the stone to powder which "killed" it and made it impossible to slake. Too little heat elsewhere left the stone uncalcined. Consequently a number of precautions were taken. First, the opening at the base of the kiln, through which the fire was fed and the burnt lime was later drawn off, was situated on the side opposite the prevailing wind, and often was further sheltered with a sunken approach. When the fire was started this opening was controlled by a door or by masonry blocking which regulated the air supply to the fire. Second, a wind baffle was erected around the top of the kiln. In some kilns this was a fixed wall; in others the baffle was a moveable wooden screen (Fig. 3, *b*). Third, on top of the kiln itself the limestone was covered with large flat stones roughly set in clay, leaving a few holes for smoke to escape.

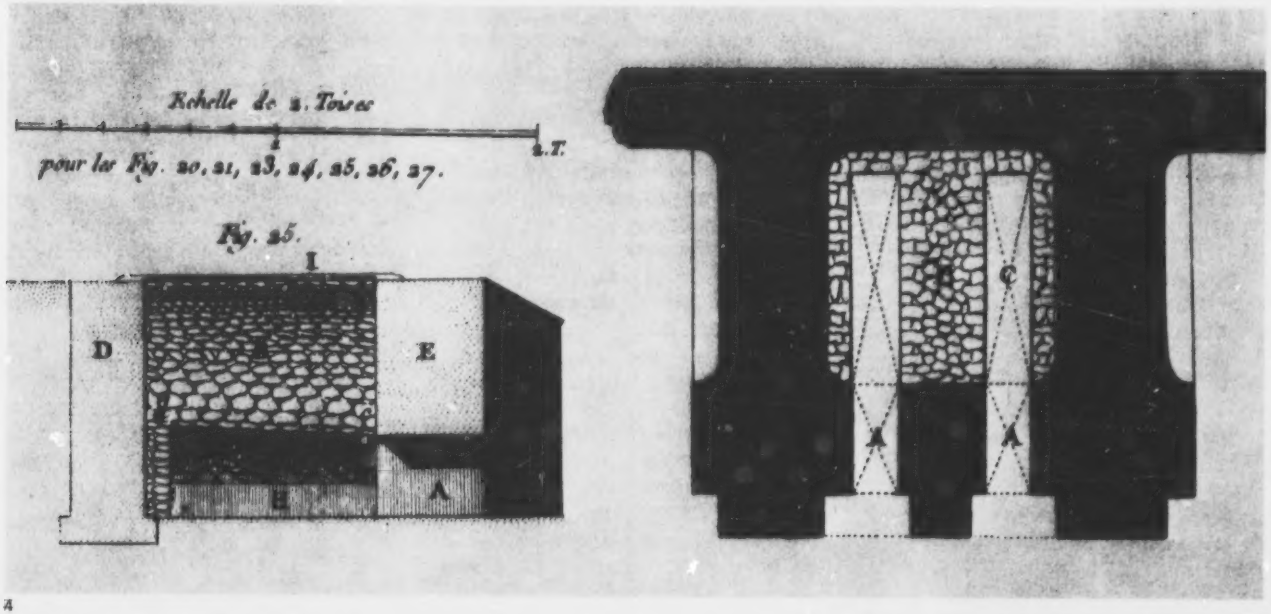
The most complete description of the firing of a flare kiln is given in de Charleville.

Whatever the size of the kiln one should always start with a slow fire, especially for new kilns.

The nature of the stone which often breaks when the fire seizes it, and the nature of the wood can alter the duration of the slow-firing from twelve to forty-eight hours.

At the start of the firing the stone becomes wet, the water which comes out covers the surface, and it is not

4 Cross-section and plan views of a type of flare kiln, found in Alsace, with a rectangular furnace and two openings for fueling fires set beneath the two tunnel arches of limestone. This type of kiln was designed to ensure more even burning throughout the load of limestone. *(Fourcroy de Ramecourt, L'Art du chaufournier [Paris: n.p., 1766], Pl. 7.)*



4

until eight or twelve hours after the fire has been lit and burning gently and continuously that the stone is completely dry. Then the smoke sticks to the stone which becomes black; one must increase the strength of the fire a little and keep it to the same heat until the smoke is completely burnt off, which will be noticed because the stone returns to its original colour: subsequently one can safely gradually increase the intensity of the fire and carry it to its highest point.

The fire is increased in intensity in the ratio of 1, 2, 3, 6, so that after thirty-six hours it is at its maximum heat....

One knows that the lime is burnt when the top of the kiln does not give off any more smoke, when the load of lime settles about one-sixth of its total height, and when the centre of the mass of stone is a nice bright red and whitish pink. All the degrees of fire mentioned can be recognized by the colour of the flame that escapes from the top of the kiln. Generally it appears first black, brown, then red, then violet, finally blue, and it finishes by being yellow and white that is scarcely visible.[11] [Translation.]

Other authors described similar processes but there is some disagreement as to the length of time necessary for firing. Diderot stated that the normal firing time was 12 hours which seems rather short but still within the 12- to 48-hour range of de Charleville.[12] On the other hand it is difficult to equate Diderot's figures with those of de Ramecourt, who suggested that a firing lasted four to six days.[13]

There were also some differences of opinion concerning the best type of wood fuel for flare kilns. De Charleville went into the subject most thoroughly and came to the conclusion that the best woods were pine, aspen, willow and fir because they burnt with a lot of flame and little smoke.[14] Green wood could be used if it had been heated and dried before being placed in the kiln. De

Charleville recommended that the fire be started with fascines of brushwood and reeds, then brought to a higher temperature with white woods, followed by oak and a resinous wood to keep the fire at maximum heat.[15] However, Diderot stated that fascines of brushwood were sufficient for the whole firing, and many of the kilns described by the Ramecourt used this fuel exclusively.[16] For those kilns using other woods, de Ramecourt recommended poplar since it flamed very easily.[17] Per Kalm on his travels through Quebec in 1749 noted that cedar was there regarded as one of the best fuels.[18] The Masse treatise commented that the kilns shown in the illustrations were normally fired with brushwood or pine fagots, but that the king's kilns were fired with coal.[19] It is not certain, however, whether he was referring to flare or running kilns. De Ramecourt and de Charleville recommended coal only for the latter.[20]

In Alsace there was an unusual type of flare kiln that was square with a low central partition and two arched entrances (Fig. 4). The partition served principally as a ledge for the jambs of the two tunnel-like arches of limestone that ran through to the back wall. The tunnel shape and the use of two arches resulted in an easier and quicker circulation of heat through the mass of stones.[21] A modification of this type of kiln was used to fire bricks and tiles at the same time as calcining limestone. However, the method was not economical in France, and contraction of the limestone caused disturbance and distortion of the bricks and tiles lying on top.

Running Kilns

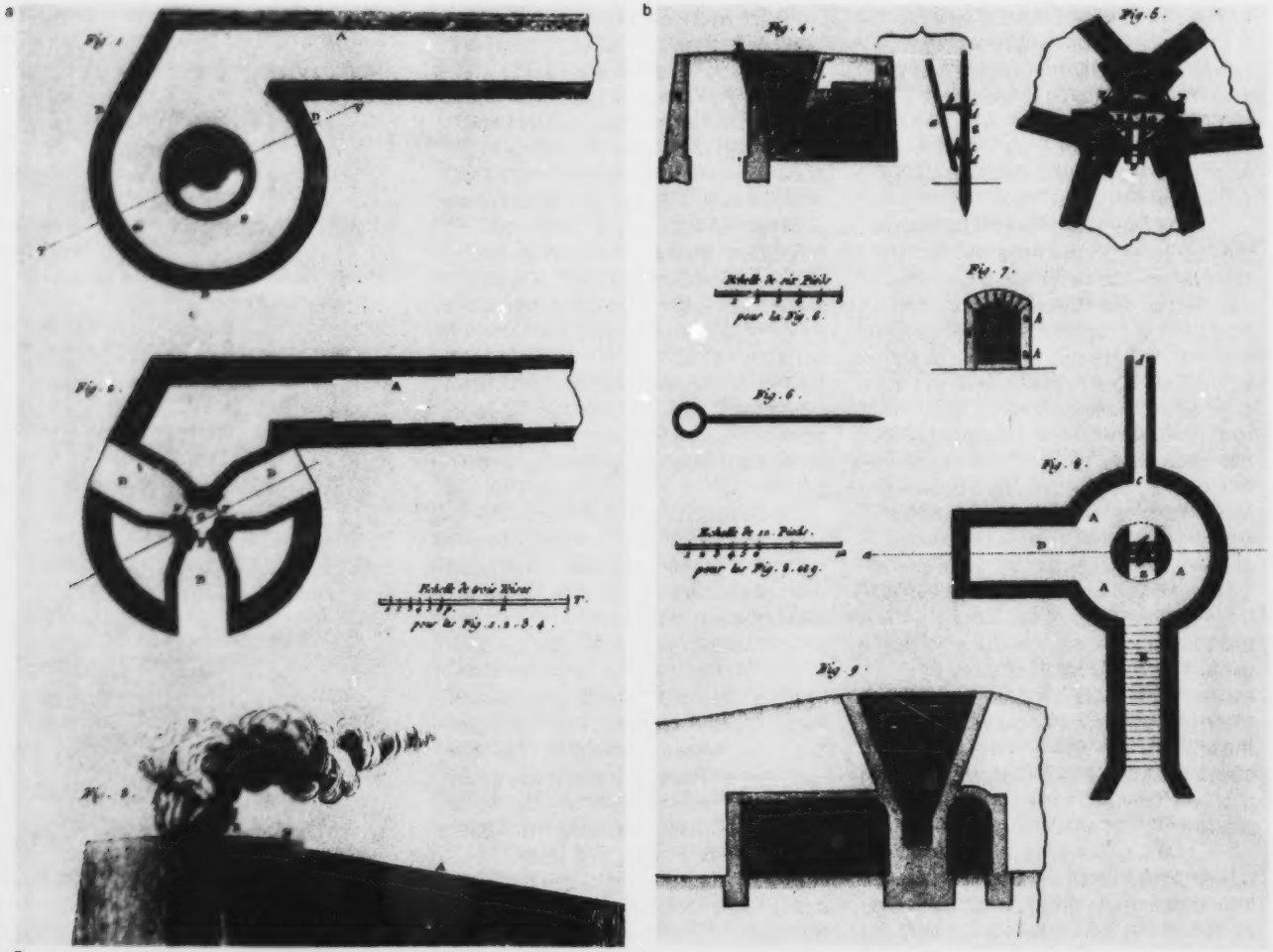
It appears from the statements of contemporary writers that by the mid-18th century, running kilns were as common as flare kilns for supplying large amounts of lime.

The most common interior shape was an inverted cone or pyramid. The latter shape was used when the kiln was fired with wooden logs and was necessary to allow the large pieces to entirely cover the inside of the kiln. Inverted cone-shaped kilns were usually fired with coal, partly because it was cheaper, and partly because the smoke from burning vegetal matter, including wood, was believed to block the pores of the limestone and make calcination difficult.

De Ramecourt believed that the best type of running kiln was found in Flanders. His description of it was copied verbatim into the supplement of Diderot's *Encyclopédie*, together with a reproduction of the illustrations (Fig. 5), which show a double-walled circular kiln approximately 11 *pieds* high with a shallow loading ramp built at a tangent. The interior of the kiln was an inverted cone, 7 *pieds* in diameter at the top, decreasing to 20-28 *pouces* at the *cendrier* or ash-box which was 15-17 *pouces* deep (Fig. 5, *4, G*). Around the base of the kiln there were three drawholes, 12-13 *pouces* wide, closed by metal doors that opened into the *cendrier* (Fig. 5, *5, F*). Access to these was gained by means of short covered passageways which ran through the body of the kiln (Fig. 5, *2, D*). In those kilns that were built into the side of a hill, access to these passageways would necessitate excavating long sunken pathways into the hillside. To avoid this expensive task such kilns were frequently built with a circular covered corridor around the kiln wall giving access to all the drawholes (Fig. 5, *8, 9*). The drawhole arches were supported by iron bands since they were subject to damage when the lime was being drawn off (Fig. 5, *7, i*). At springer level each of the drawholes had an iron bar running across the opening and anchored in the masonry jambs (Fig. 5, *7, e*). Other iron bars were laid across these iron bars spanning the cendrier to form a grille on top of which the fuel and limestone were placed (Fig. 5, *5, E*). To load this type of kiln the limeburner *arranges three or four armfuls of well dried wood* [on top of the grille] *which he covers with a layer of three or four* pouces *of coal in pieces the size of a fist....*

Then the limeburner takes a basket of pieces of limestone... and throws them upon the bed of coals...: he roughly arranges these pieces, usually with his foot... so they cover all the coal. On top of the bed of stones which is called a charge *and is 3 or 4* pouces *thick at the most, he spreads a bed of coal or charcoal....The limeburner repeats the same sequence of* charge *and charcoal until the kiln is completely filled. He is careful only to make the* charges *a little thicker the higher he goes, especially toward the*

5 A running kiln from Flanders. *a*, plans and elevation; *b*, Fig. 4, cross-section; Fig. 5, enlarged plan view of the *cendrier* with the iron bars in place; Fig. 6, a rod for removing the burnt lime; Fig. 7, one of the doors to the *cendrier*; Figs. 8 and 9, plan and cross-section through a similar kiln with an encircling tunnel for access to the drawholes. *(Supplément à l'Encyclopédie, s.v. "Chaufournier.")*



5

centre of the kiln where the fire is often hottest.[22] [Translation.]

To fire this kiln the following method was used.

To light it a bundle of straw is thrown into the cendrier *to which is added a few pieces of dry wood; the drawhole into which the wind is blowing most directly is the one chosen* [for lighting the fire]. *If the wind is too strong, such of the other drawholes as will carry the flame out*

of the cendrier *are closed. In a few minutes the wood on the grille catches fire; when it is burning well and smoke starts to come out of the top of the kiln, all the drawholes are blocked with stones and earth or sods so the fire does not burn too quickly.*[23] [Translation.]

The fire was then left to burn its way up through the lime. When all the fuel at the bottom of the load was consumed, the limeburner opened each of the drawholes in turn and removed the bars of the grille. The burnt lime then immediately fell into the *cendrier* where it was shoveled into barrows and carted away, while the load above settled further into the kiln. Once the bars had been removed at the base, drawing off the lime became an almost continuous process that was carried out equally from all three drawholes to minimize uneven slumping of the load. As the process continued, the drawholes gradually became blocked with ashes. When this happened, the bars were forced back into position and the ashes cleared out. These ashes could then be sold for mixing into mortar that was to be used in damp places.[24]

At the same time as the lime was being drawn off at the base of the kiln, more stone and fuel were being added at the top in the void created by the slumping and settling of the mass within the kiln. It was from the continuous nature of the firing and loading process that these kilns were known as *fours coulants* or running kilns.[25]

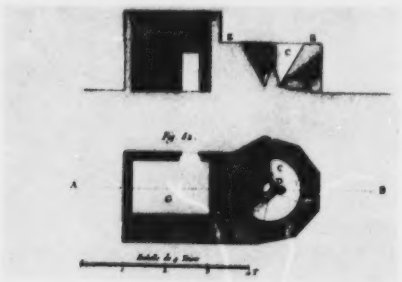
De Ramecourt stated that he had seen kilns similar to those from Flanders in the Rhône valley (Fig. 6, *a*). They were more simply made from local fieldstone, usually sandstone, and mortar was used as a bonding agent, but the over-all shape was similar with the exception of a short pillar occupying what would have been the *cendrier*. This pillar served two purposes: first, it supported the wooden planks that carried the load of fuel and limestone in a manner similar to the iron bars in the Flanders kilns; second, it channeled the burnt stone to the three drawholes by dispersing the mass of stone as it descended through the kiln.[26]

Other types of running kilns were used for different fuels. It seems that hard limestones were often burnt with charcoal in special cylindrical kilns, though de Ramecourt could see no reason why ordinary kilns could not be used.[27] However, many limeburners did not like charcoal as a fuel since it was supposed to make the lime "bitter" and difficult to mix with sand. These kilns were approximately 10 *pieds* in over-all diameter, but only 4.5 *pieds* wide inside, and up to 18 *pieds* high (Fig. 6, *b*). There was a single opening at the base with a short flue running to the centre of the kiln.

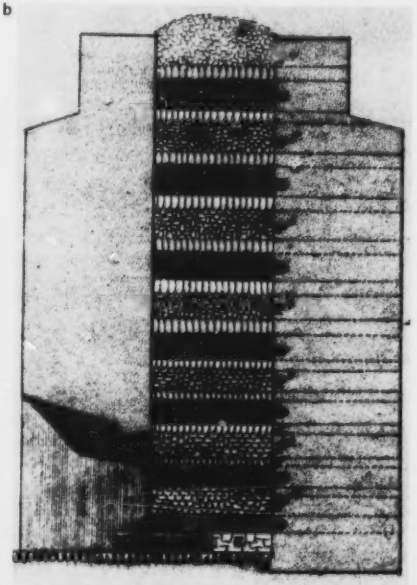
In Picardy a very simple type of kiln was used for burning soft limestones. These inverted pyramid kilns were 5 *pieds* wide at the top and 6 *pieds* high. They were cut into the earth and lined with brick, leaving a single opening at the base. Peat was the normal fuel for these kilns.[28] No

6 Running kilns from *a*, the Rhône valley, with a pillar occupying the *cendrier*; *b* from Méziers; *c*, from Maubenge, a simple type that was operated as a hybrid flare/running kiln. *(Fourcroy de Ramecourt, l'Art du chaufournier, [Paris: n.p., 1766], Pl. 14, 15.)*

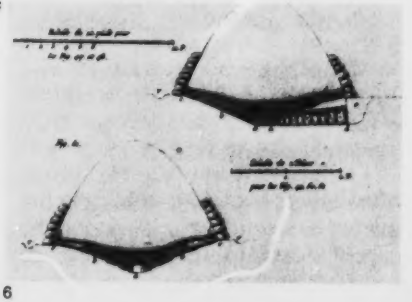
a



b



c



6

illustration is given of this type of kiln, but it sounds very similar to the simple lime-kiln structure number 47 found at Jamestown, Virginia in a late 17th-century context.[29]

Finally there was a type of kiln that was neither flare nor running yet had characteristics of both. This kiln, commonly used by individuals for a single load of lime, was a circular structure 18 *pieds* in diameter. It consisted of a shallow depression with a stone-lined channel running to the centre from a small pit on the perimeter (Fig. 6, *c*). Baskets of medium-sized stones were thrown into this hollow forming a flat layer. On top of this a thin layer of powdered coal was laid leaving a gap around the edges. On top of the powdered coals alternating layers of coal and stone were laid up to a height of 14 *pieds*. The whole cone-shaped mass was then plastered over with clay and the lower parts were reinforced with stone.[30]

This kiln can hardly be described as a flare kiln since the fuel and limestone were arranged as for a running kiln. But, since the kiln had to be demolished to be emptied, it does not qualify as a running kiln either. As with the simple flare kiln described by Diderot, this one was cheap to build but the cost of lime from it was high.

Slaking

After lime had been burnt to form quicklime, it had to be slaked to form a hydrated lime suitable for mixing with other materials to make mortar. Slaking involved adding water to the lime, which absorbed it as water of crystallization, giving off heat up to 300°C. and causing rapid expansion. During slaking, especially with hydraulic limes, the silica and aluminum impurities combined with the lime to form cementitious compounds that were insoluble in water. This resulted in a mortar capable of setting under water. A non-hydraulic lime could be converted to an hydraulic lime by the addition of various materials (e.g., pozzolana, crushed tile, burnt shale).

Slaking had to be carried out as soon as possible after burning since the quicklime was liable to absorb moisture from the atmosphere and start spontaneous air-slaking, which reduced the quicklime to a pulpy powder that would not properly expand when fully slaked.

There were two methods of slaking described in numerous 18th-century treatises on building. One which most authors accredited to Philibert de Lorme, but which probably was a very ancient method of slaking, was designed to produce large quantities of high quality lime that could be stored and used over a long period of time. The other was better suited for producing lime to be used immediately.

Although Diderot claimed that de Lorme's method was an old-fashioned one, it was still described in 1777 by J. F. Blondel as the best method of slaking lime.

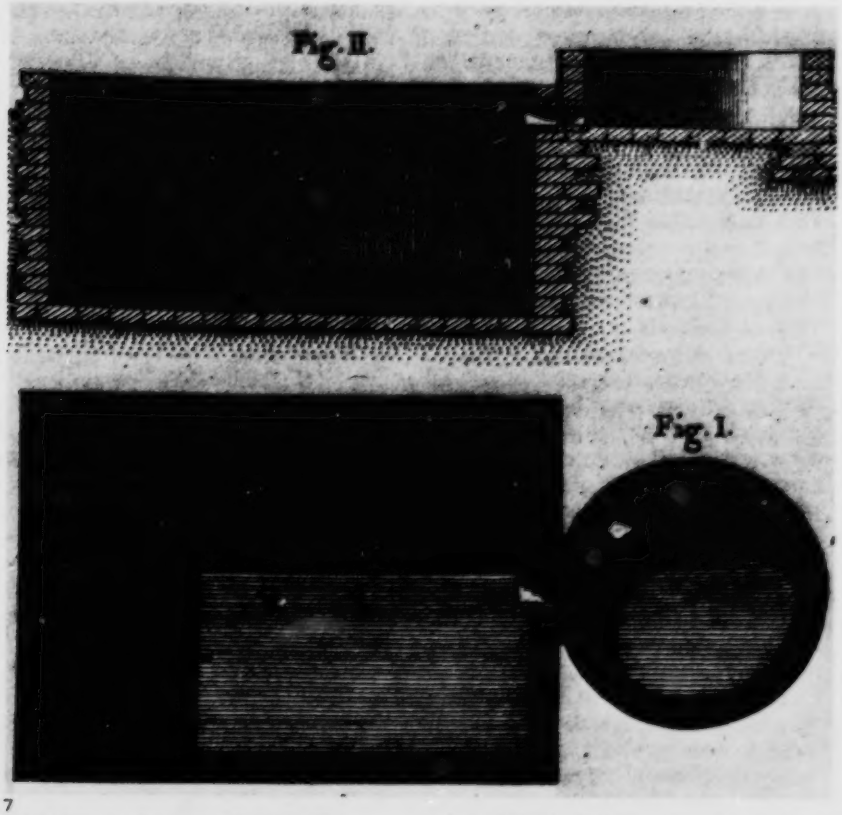
The best way to slake lime is to put in a pit the number of stones of quicklime that one thinks one will use, after having crushed them with a sledge-hammer to reduce them to pieces of almost equal size, in order that they may be slaked equally. It is then necessary to cover the lime equally over-all with one or two feet of good sand, and throw onto the sand as much water as is necessary to sufficiently soak it and slake or fuse it without burning; if the sand cracks and allows the smoke to escape, the holes are at once covered with fresh sand, after which the lime can be left to rest as long as one wishes: it will become smooth, rich, and perfect for masonry.[31] [Translation.]

A slightly different description of de Lorme's method in Diderot advised a wait of two or three years before using the lime.[32] One treatise written in 1743 stated that lime made this way would keep for 20 years.[33] Another treatise written in 1728 recommended lime slaked by this method for lining walls and backing frescoes, since it did not absorb the paint.[34]

The second method of slaking was more efficient since it enabled the mason to eliminate unburnt lumps of limestone from the mass of lime in the initial slaking process (Fig. 7). Again, Blondel gave the most complete 18th-century account of this process.

In order to rid the limestone of lumps which may occur in it, one takes precautions in this respect where building is being carried out that requires some care. Consequently, one digs two pits, next to each other and of unequal size, which are

7 Plan (Fig. I) and cross-section (Fig. II) of slaking and storage pits. The lime was slaked in the smaller circular pit (A), then run off through a channel (C) to a large rectangular storage pit (B). *(Jacques Françoise Blondel, Cours d'architecture* [*Paris: Desaint, 1771-77*], *Vol. 5, Pl. 64.)*



7

joined by a channel. The smaller, which is at the same time higher, is used for crushing the quicklime, and retaining the lumps found there; the larger is intended to serve as a sort of reservoir, designed to contain a load of slaked lime proportionate to the size of the building to be erected. In order to let into the latter pit only what is supposed to get there, one takes care, not only to place a grille of wood or iron in the channel, to stop all the larger pieces, but also to keep the bottom of the smaller pit higher toward the channel, in such a way that the lumps are caught there. These precautions having been taken, one cleans thoroughly the first pit and fills it with lime on which one first pours a little water to start the slaking; while that water is being absorbed one pours on more until the lime is completely dissolved, after which one pours on more to conclude the slaking, taking care to stir it and work it well during this operation with a wooden rabot. *It is necessary to avoid using too much or too little water; too much water will drown the lime or lessen its strength, and too little on the other hand will burn it, destroy the pieces and reduce it to powder. The lime held in the small pit, having been sufficiently stirred many times over, is run off by itself into the larger one by opening the communicating channel, continuing to stir until the pit is empty. Then, one closes the passage and immediately repeats the operation until the second pit is full. Finally, when the lime thus slaked has taken on a little hardness in the large pit, one covers it with one or two feet of sand, in order to be able to keep it as long as is desired, and use it when one needs it, without fear that it will lose its quality.*[35] [Translation.]

Briseux wrote that after the lime had been poured into the larger basin it was watered for four or five days until no more cracks appeared and the lime became one homogeneous mass, after which it was covered with sand.[36]

There are two articles by different authors in the *Encyclopédie* dealing with slaking that describe a similar procedure to that of Blondel except that one of them, in contradiction to the other, states that too much water will not hurt the lime, and cautions only against using too little water.[37] Diderot regarded the main

advantage of this method to be its ability to provide lime for immediate use, and, therefore, made no mention of covering the lime in the larger pit with sand.

De Charleville, writing in 1828, made no mention of de Lorme's method, but did describe in detail a method similar in principle to the second one described by Blondel.[38] It differed in the use of a wooden tank instead of the smaller pit, although he did note elsewhere that a pit may sometimes be used. De Charleville agreed with Blondel, against Diderot, that a very precise amount of water should be used, but he also concurred with Diderot against Blondel, that the purpose of this method was to provide lime to be used almost immediately.

One method of slaking for high-quality lime was to make a depression in the centre of a mound of sand into which was placed some quicklime. The quicklime was watered and covered with a layer of sand for seven or eight hours until the slaking was completed.[39] By this method the lime turned to a fine powder rather than the pulpy mass resulting from the other methods.

Other methods of slaking that came into use in the 19th century—immersion, complex and spontaneous slaking—were mentioned by de Charleville and other later authors.[40]

De Lorme's method was not mentioned in any of the available 19th-century sources. Instead the emphasis was on the method described by Blondel. The reason for this is clear: de Lorme's method was not susceptible to mass production in any age when the scale and speed of production were becoming ever greater. His method involved a long wait between slaking and use. By contrast, Blondel's method, especially as seen by de Charleville, was ideally suited to continuous production. There is, therefore, the same movement from intermittent to continuous production in slaking as occurred in the burning of lime.

Introduction to the *Faubourg* Lime-kiln

The site

The *faubourg* lime-kiln was built into the side of a low hill outside the landward defences of the fortress, approximately 200 yards northwest of the Dauphin Demi-bastion, in the area known as the *faubourg* or suburb (Fig. 8). The terrain in this area is mostly marsh with a number of low hills of glacial moraine rising out of it. The hills overlook the fortress defences and were the sites of enemy batteries during both sieges of Louisbourg. The hill on which the lime-kiln stood was the closest to the town and was the site of the "Advanced Battery" in the first siege of 1745.[1] To prevent the use of this hill a second time the French removed the top seven *pieds* in 1757. Apparently the precaution was effective since no battery was erected on this hill during the second siege the following year.

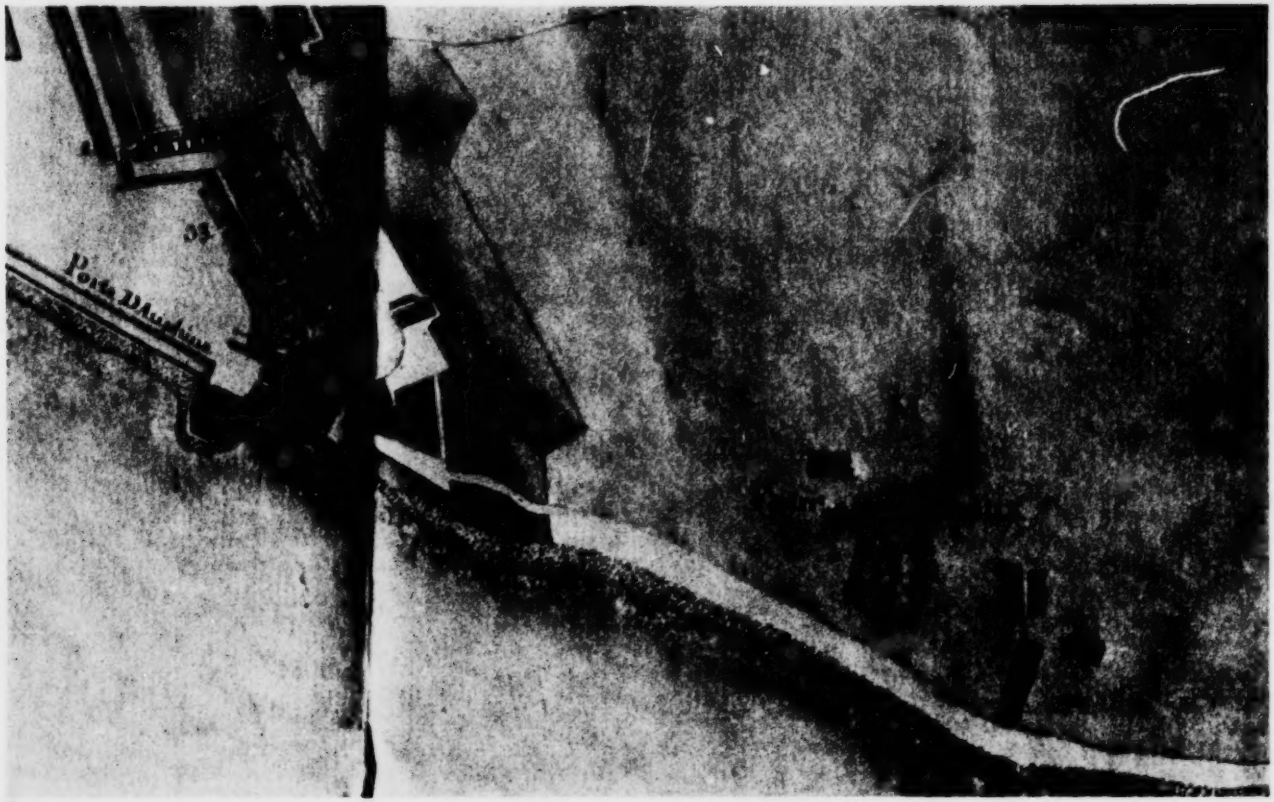
The effect of lowering the hill was to move the crest toward the south, where a complete natural stratigraphic sequence was revealed during excavation. On the north and west sides of the hill, by contrast, there was no A or B horizon, but merely a thin topsoil overlying the weathered surface of the C horizon, which was a yellow, stone-filled, glacial till.[2]

History

The first kiln on this site was built in 1755 according to a letter written by Franquet in that year.[3] Lime-kilns were frequently built to supply lime for specific nearby construction projects, and in the years 1755 and/or 1756 the only major work in this area was the strengthening of the Dauphin Gate by the addition of a thick rampart made of rubble-stone set in mortar. This type of construction required a vast amount of mortar, yet prior to the building of this kiln, the nearest place where lime could be burnt was at the kilns near Rochefort Point on the far side of the town over three-quarters of a mile away. In addition to the problem of their location, Franquet also noted that these Rochefort Point kilns were small and badly built.[4] These disadvantages made the construction of a bigger and better kiln near the site of the work most desirable.

One further advantage gained from this choice of location outside the town was that it avoided the problem of noxious fumes and the risk of fire associated with those earlier kilns built within the town boundaries. We have no documentary record of any edict banning the construction of kilns within the town of Louisbourg, but there may well have been

8 Plan of part of the *faubourg* in 1757 with the Dauphin demi-bastion on the left. The kiln was probably built to supply lime for construction work at the Dauphin Gate in 1755-56. From a plan entitled "Louisbourg en l'Isle Royale." *(Original source unknown; copy on file at Public Archives of Canada.)*



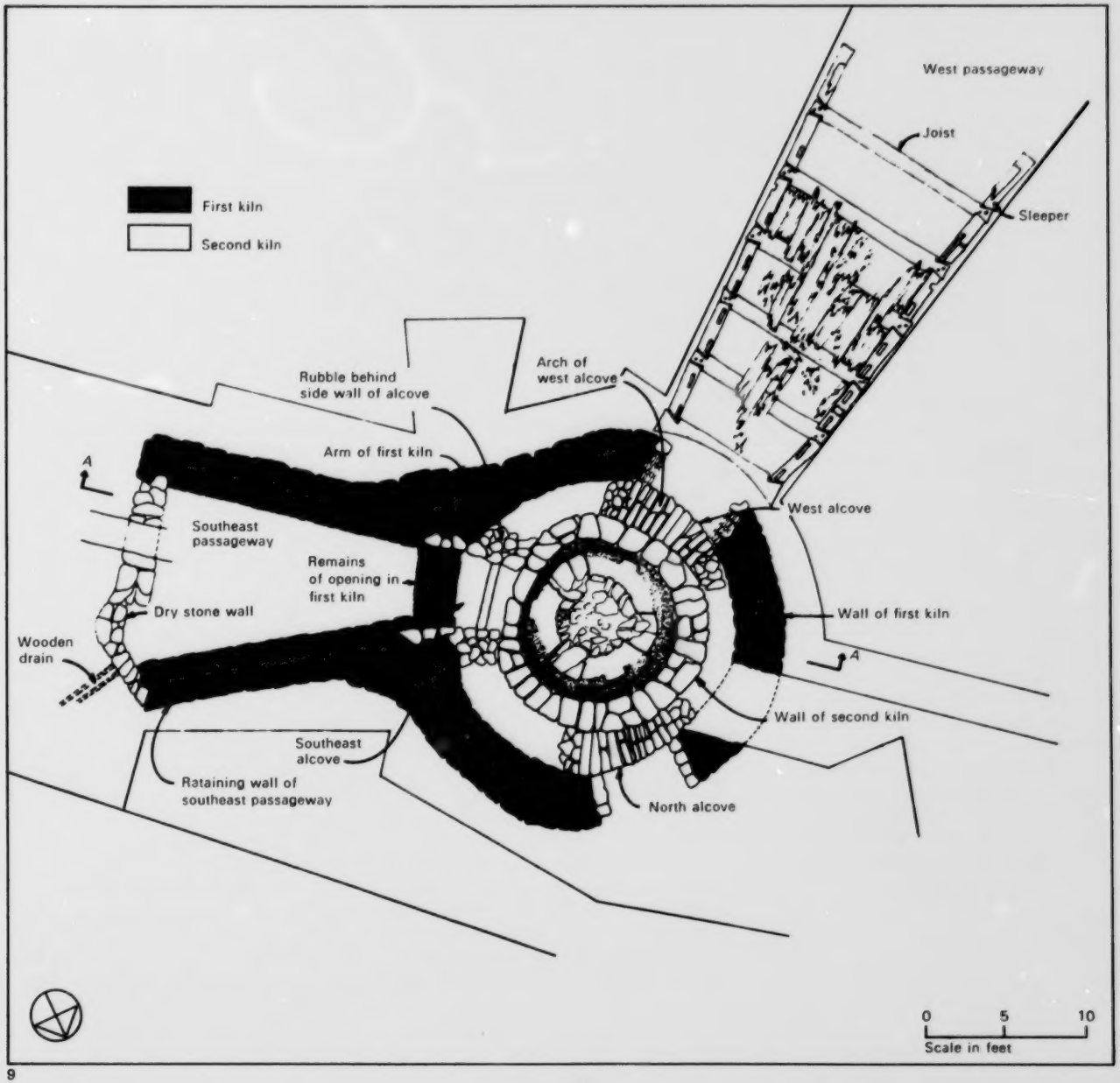
8

such a restriction imposed after the return of the French in 1749 since all subsequent kilns were built outside the town limits. Certainly such restrictions were common in this period in many parts of Europe.

The development of the kiln can be divided into two stages (Fig. 9). In the first the kiln was a circular, open-topped structure built into the southeast side of the hill and, by the addition of banks around the upper parts of the wall, mostly subterranean. Its appearance was probably very similar to the kiln at the Royal Battery which shows the top 6 ft. of the wall above ground (Fig. 25, *c*). Leading from an opening on the southeast side, away from the prevailing wind, there was a sunken, stone-lined passageway with a wooden drain emerging from the end.

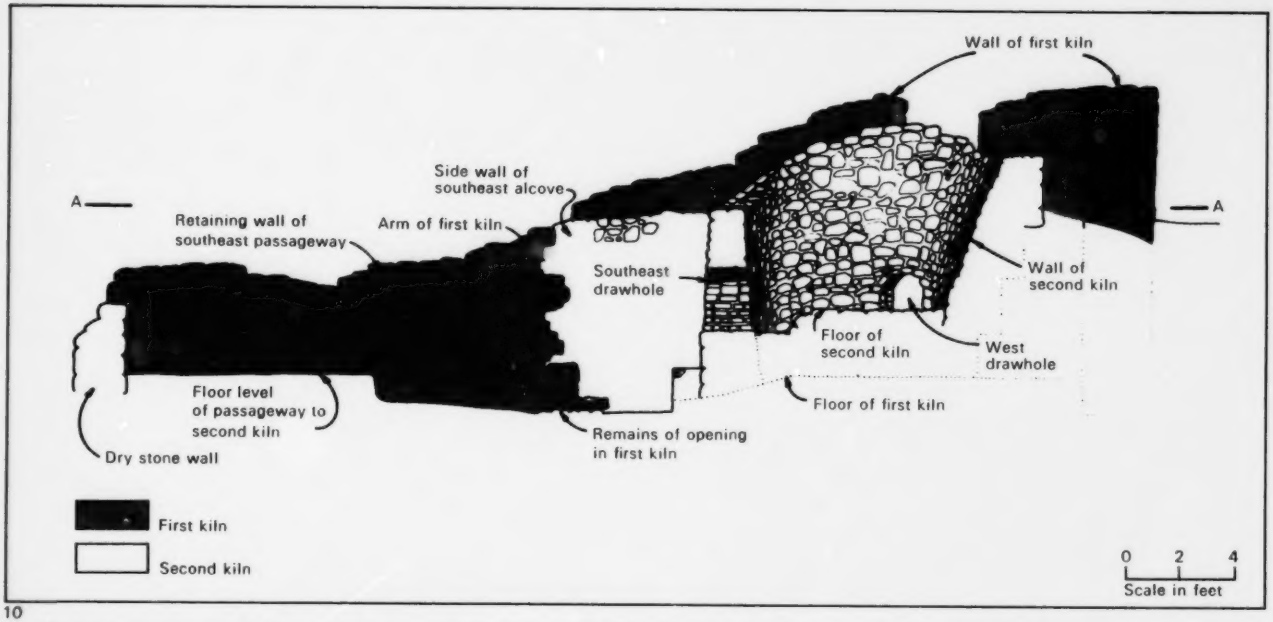
In the second stage the first kiln was partly filled and a second one built inside it. The latter was a more elaborate structure with three drawholes on the southeast, north and west sides. Access to the drawholes was gained by cutting alcoves through the wall of the first kiln after having dug passageways through the hillside to the base of the wall. These passageways, as much as 10 ft. deep in places and up to 15 ft. wide, were maintained by laying a wooden floor and by revetting the sides with timber framing and planking. The rela-

9 Plan of the *faubourg* lime-kiln.



9

10 Section through the *faubourg* lime-kiln.



10

tively large expense of these alterations on a minor structure such as a lime-kiln must have had some justification, and this is partly to be found in the greater efficiency of the new design, which changed the method of operation of the kiln from flare to running by providing drawholes for withdrawing the burnt lime.

In the previous section we have seen the advantages of the running kiln both in economy of operation and in its ability to provide a steady supply of lime. These improvements were partly offset in this kiln by the fact that it had considerably less capacity than the first; which suggests either that the main phase of construction was completed at the Dauphin Gate and the demand was less, or, more likely, that the first kiln had proved so inefficient that it was worthwhile to reduce the size of each load in return for a product of a better quality. There is no record of when the second kiln was erected or how long the first one was used. Neither could have had a very long life, however, since during the second siege in 1758 the French sallied out of the fortress on two successive nights to level the warehouse associated with the kiln and to demolish the kiln itself.[5] From the excavated remains of the kiln, which was filled with rubble, it seems that demolition took the form of pushing in the top part of the kiln to prevent its use as cover by the besiegers. It is probable that the French also filled in the passageways to the drawholes, since the almost vertical sides remained when excavated. If they had been left open to the elements they would quickly have eroded to a shallow slope, as they did when left open for just one winter after excavation in 1968.

Thus the active life of the kiln was three years at most, compared with seven years for the kiln near Block 1 inside the town and an intermittent 20-odd years for those near Rochefort Point (*see* Other Lime Kilns at Louisbourg). Whether it was intended to use the kiln for longer is

11 General view of the *faubourg* lime-kiln after excavation, looking northwest.

11

uncertain, but the large investments of time and money suggest that it was.

It is interesting that this is the only kiln known to have been built at Louisbourg after the arrival of a master limeburner in 1752.[6] Perhaps it was his knowledge of the more sophisticated running kilns in France that led to the construction of the more elaborate second kiln.

The First Kiln

The Kiln

The site of the first kiln was prepared for construction by excavating a circular hole 23 ft. in diameter into the southeast side of the hill. A trench about 20 ft. long joined the hole on the southeast side to create a sunken passageway to the opening which served for both fueling the fire and drawing off the burnt lime.

The over-all diameter of the kiln was the same as the diameter of the hole since the wall was built against the side of the excavation. With a wall varying in thickness between 2.2 ft. and 3.5 ft., the average internal diameter was 18 ft. At its highest point the wall survived 10.75 ft. above its base (Fig. 11). On the southeast side the kiln wall thickened out into two short arms flanking the opening (Fig. 9).

The hole for the main body of the kiln was not dug to the same depth all the way round. At the entrance the base of the wall was at an

elevation of 7.5 ft. above sea level, but on the north side it was at 9.0 ft. above sea level. Since there was undisturbed C horizon material against both the outer and inner faces of the lower courses of the wall, a foundation trench must have been dug around the circumference of the hole.

A continuous bond between the footings of the retaining walls of the sunken passageway and the footings of the short arms flanking the opening, which in turn were bonded into the kiln wall, showed that the footings for the entire structure must have been laid at the same time. A gap was left in the footings of the kiln wall for the brick sill of the opening, which was laid directly on the exposed C horizon surface. This sill was laid with its inner edge following the curve of the inner face of the kiln wall; it was 2.8 ft. wide and extended through the thickness of the kiln wall.

With the foundations laid, the next construction stage was the erection of the kiln wall and arms. Since the wall was built against the sides of the hole, the outside face was irregular up to the pre-kiln ground level, above which it was smoothly faced, as was the inner face from the floor up. The junction between the rough and smooth finished outer face always occurred where the outside stratification showed the original turf line beneath the banks meeting the kiln, and revealed a drop in the surface level of over 2 ft. between the north and south sides.

While the walls were going up, the brick jambs of the opening were being inserted. These were inset from the alignment of the arms by approximately one foot and were bonded at the back in a rubble-stone offset that was a vertical continuation of the lip of the footings. The effect of this arrangement was to narrow the opening from 4.8 ft. to 2.8 ft. Excavation revealed that the jambs had survived for only three courses, above which they had been demolished when the approach was widened during the construction of the second kiln.

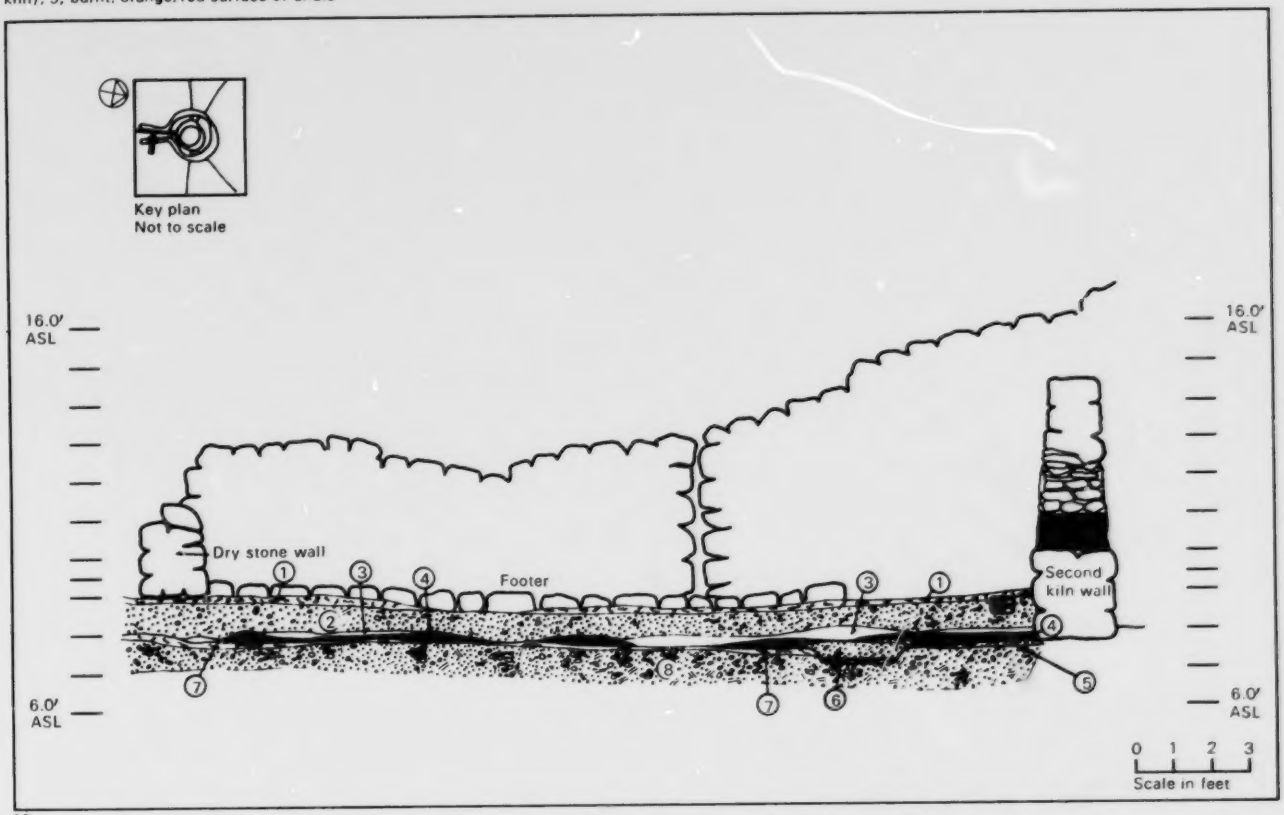
Over the jambs there would have been an arch, probably of flat stones laid radially around the curve, and possibly with an iron support band similar to those in the arches of the second kiln. There was probably also an arch over the two arms, but nothing remained of either one. Their existence is suggested by similar arches on illustrations of other kilns (Fig. 1). Comparison with these same illustrations and the arches of the second kiln suggests that the arch over the arms was probably higher than that over the opening, to facilitate access to the latter.

The bonding material for the kiln wall was a red, burnt clay which, when excavated, had a crumbly, brick-like texture. This material was originally clay mixed with water, or puddled clay, which was a bonding agent recommended for those parts of lime-kilns that were exposed to direct heat, since mortar would not withstand high temperatures. Mortar was used, however, on the arms of the kiln, which were not exposed to the heat of the fire.

The floor of the kiln was revealed in only a few places because the presence of the second kiln on top of it prevented complete excavation. One section was uncovered near the centre of the floor at an elevation of about 9.5 ft. above sea level, and another was exposed between the walls of the first and second kilns on the north side at a similar elevation. In both cases the stratification consisted of a re-deposited C horizon layer beneath the stone floor of the second kiln, below which was a thin layer of lime overlying the floor which consisted of the orange-red burnt surface of the undisturbed C horizon. The floor, therefore, was the bottom of the hole excavated for the kiln, and the fire was laid directly on it.

The same stratification was present near the southeast opening, with the burnt surface at an elevation of about 8.2 ft. above sea level indicating a slope downward toward the opening. But the floor did not meet the opening at sill level. Instead it continued over the brick sill about 0.5 ft. above it and at the same level as the top of the surviving jambs (Fig. 12). As it approached the opening, the stratification was the same as elsewhere, but over the sill itself the material underlying the floor was a re-deposited, stone-free C horizon layer. The sill level had been raised by depositing a 0.5 ft. thick layer of cleaned (i.e., stone-free) parent material over it; a step which must have been completed before the kiln was ever used since the burnt floor was on top of this layer of fill. This method of construction would also explain

12 Section along the southeast passageway. *1*, mortar-destruction layer (1758); *2*, red, stony, clay loam fill for floor of passageway of second kiln (redeposited C horizon); *3*, lenses of lime (probably represent dropping when first kiln was being emptied); *4*, coal and burnt organic matter (remnants of fuel used in first kiln); *5*, burnt, orange/red surface of undisturbed C horizon (floor of first kiln); *6*, stoneless, red, clay loam fill over sill of first kiln (redeposited, cleaned C horizon); *7*, mortar (construction surface of passageway to first kiln); *8*, red, stony, hard-packed clay loam (undisturbed C horizon).



12

why the bottom three courses of the jambs of the opening survived. If they had been exposed when the approach was being widened, they would certainly have been removed since they would have obstructed passage to the second kiln. Since they did survive they must have already been hidden by the fill placed on top of the sill.

Presumably the sill was filled over to rectify a mistake made in the original layout of the opening. While this sort of explanation is obviously open to abuse as a catch-all for misunderstood or misinterpreted features, there is some evidence in this case to support it. First, since the brick sill was laid at the same level as the base of the kiln wall and since the base of the kiln wall was laid in the bottom of a foundation trench, then the sill would also be in the bottom of this trench. Second, the existence of this trench across the opening could be observed by the presence of undisturbed C horizon material immediately inside the opening at a level higher than the brick sill. The result was that the sill was about 0.5 ft. below the floor level of the kiln. It is easy to see that this could be overlooked when the foundation

trench was being dug and the footings of the walls were being laid, and equally evident that in that position the sill was not functional. To remedy the situation the simple solution of raising the sill level was used. It is highly unlikely that this was an intended building sequence since there is no logical reason for laying a brick sill with the intention of filling over it; therefore, an error in the original design seems to be the most plausible explanation.

The Passageway

The retaining walls of the passageway to the opening did not bond with the arms of the kiln, but it is unlikely that this has any chronological significance because both the walls and the arms were constructed on footings that were laid at the same time. It is more likely that the butt joint reflects the building sequence of first the foundations, then the kiln wall and arms, then the retaining walls, rather than a later modification. The retaining walls were only one course thick along the sides of the passageway trench, but once pre-kiln ground level was reached they thickened out to 2 ft. and rested partly on the wall below and partly on the A horizon behind, the old turf line having been removed.

The floor of the passageway to the first kiln was originally dug to the level of the brick sill, and excavation revealed a layer of mortar, representing the construction surface, resting on the unweathered, undisturbed C horizon. However, when the sill of the opening was raised, the floor level immediately outside was raised as well, gradually sloping down to the original floor level further along the passage. Thus at the outer end of the passage there was a black layer of crushed charcoal lying directly on the mortar of the construction surface, but at the opening there was a layer of redeposited C horizon between the construction surface and the black layer. This black layer presumably represented the remnants of the wood fuel scraped out of the kiln after firing. On top of the black layer there was a number of lenses of lime which were probably dropped and spilled when the kiln was being emptied. It is curious that only one layer of burnt matter and one layer of lime were present, since one would expect a gradual build-up of alternate layers with each firing. Perhaps the kiln only survived one firing, during which the vitrification of the walls put it out of action.

A wood-lined drain 0.6 ft. wide and 0.5 ft. deep led from the outer end of the passageway in an easterly direction toward the sea (Fig. 13). The floor of the passageway near the drain was slightly lower than elsewhere and was probably dug this way deliberately to provide a run-off for the surface water that collected in the passageway, the floor of which is now well below the summer water table.

Banks

Around the kiln, banks of earth were thrown up against the wall to increase stability and reduce heat loss. Unfortunately it was not possible to determine either the vertical or horizontal extent of these banks in their original form because the excavation of the passageways for the second kiln added material to the banks and the destruction of the kiln during the second siege partly leveled them. The remains of the banks show that they were built from the material thrown up from the excavation of the hole for the site of the kiln, and that they extended completely around the kiln and along the arms and sides of the entrance passageway. Along the passageway the function of the banks was to provide more protection against direct winds into the kiln rather than to add stability to the walls.

The height of the kiln could not be determined from the remains. Historical sources and illustrations of similar kilns, however, indicate that it should be at least as high as its internal diameter, which in this case is 18 ft. Since the bottom 7 ft. or so were below ground level, 11 ft. or more would be left free-standing before the bank was constructed against it. The view of the lime-kiln at the Royal Battery (Fig. 23, *c*) shows approximately 6 ft. visible above the surface. If a similar amount were exposed on this kiln, the banks would have been 5 ft. high on the north side and higher on the south where the ground surface was lower. Since the natural angle of repose of the material used in the bank is 35°, the lateral extent of the banks would have varied between 7 ft. and 9 ft. This would not be excessive, but as the bank could nowhere be

13 Wooden drain leading from the southeast passageway. The dry stone wall across the end of the passageway can be seen running over the drain.

13

traced this far from the wall without either vanishing into the present topsoil as the old surface level rose on the north side, or being altered by the excavation of the passageways to the second kiln, it could not be proved archaeologically.

Some indication of the height can be obtained from the state of the kiln when it was excavated. The interior of the second kiln was completely filled with rubble thrown in when the kiln was being demolished during the second siege. This rubble, if used in building up the walls on top of the surviving remains, would result in a much higher kiln. In summary, the evidence concerning the height of the kiln is not conclusive, but favours a much greater height than the surviving walls alone would indicate.

Conclusions

The excavated remains of the kiln cannot positively determine whether it was used as a flare or running kiln, since the distinction is based on the arrangement of the limestone and fuel. There is, however, some indirect evidence that suggests that it was fired as a flare kiln. Illustrations of 18th-century kilns that have a shape similar to this one are shown being fired as flare kilns (Fig. 3, *d*); that is, the fire is set on the floor of the kiln and the limestone is laid over and around it. The evidence of heavy burning on the floor of the excavated kiln also suggests that it was fired this way. If so, the process would be the same as that described for flare kilns.

The wall of the kiln was covered on the inside with a dark green glaze, and the fire-reddened stones were badly cracked on the inside face—the product of vitrification due to overheating of the fieldstone used in the wall. To the left of the entrance near the base of the wall inside the kiln there was a deposit of unburnt and partly burnt blocks of limestone with a thin coating of burnt lime over the top. Where the wall was protected by this layer it was not vitrified, indicating that the vitrification took place at only one firing during which the kiln became overheated rather than gradually building up over a series of firings. This limestone must have been part of the last load that the kiln fired, since it is difficult to believe that it would have been left in the kiln from an earlier load.

The Second Kiln

The Kiln

Following the vitrification of the first kiln a smaller but more elaborate second kiln was built within its walls. This new kiln was radically different from its predecessor both in form and operation. It was basically an inverted cone with three openings at the base of the wall giving access to the interior of the kiln. At the base the internal diameter was 7.2 ft., and when excavated its walls survived to a height of about 9 ft. above the base.

Excavation between the walls of the two kilns revealed that the wall of the second was constructed in several discrete vertical stages. Each stage was built with a sloping inner face and a vertical outer face to create the inverted cone shape of the kiln. The area behind, between the back of the wall and the inner face of the first kiln wall, was then filled with earth up to the top of each stage. Since the bottom of each new stage was wider than the top of the one beneath, succeeding stages were partly supported on the earth fill behind the wall. The resulting profile consisted of a series of steps at the back and a smooth slope at the front. The advantage of this type of wall lies in keying the masonry into the material supporting it, thereby providing greater stability. Examples are to be seen in Figure 1, *2*, *3*, where it was used in the construction of limekilns of this period in France.

The original height of the second kiln is not known. It would seem that it could not have been any higher than the point at which the outward progression of the cone shape intersected the inner face of the kiln wall; however, the sloping sides of the cone were rather irregular, so this point cannot be accurately calculated. All that can be said with certainty is that it was originally higher than it survived, though probably not as high as the first kiln.

Drawholes

Three drawholes were established, equidistantly spaced around the base of the wall and opening into the kiln on the north, west and southeast sides. Access to the drawholes was gained through alcoves (Figs. 14, 15, 16) cut through the lower part of the first kiln wall.

In order to create the alcoves it was first necessary to excavate passageways through the hillside on the north and west down to the base of the first kiln wall. The wall was then breached and retaining walls were erected to hold back the fill of earth between the walls of the two kilns. Next the breach and the area between the walls was arched over. The resulting alcoves were shortened versions of the *galerie voûtée* described by Diderot (Fig. 5, *a*) 5.8 ft. long and 3.6 ft. wide, which provided a sheltered place from which the lime could be drawn.

The North and West Drawholes

Both the north and west drawholes (Figs. 14, 15) were substantially similar and therefore will be considered together. In both, the actual opening was 3.25 ft. wide on the outside, narrowing to a width of 2.3 ft. at the inner edge. Both openings were 2.5 ft. high and both set in a wall

14 The north drawhole from inside the second kiln.

14

about 2 ft. thick. The jambs of the north drawhole were brick starting at the base of the wall with an offset on the outside for the first six courses. However, since the side walls of the alcove were built on top of this offset it does not appear to have served any purpose. The jambs of the west drawhole (Fig. 15) were of rubble masonry except for the outer corner of the right-hand jamb, which was of brick. In this case the lowest courses of the kiln wall ran beneath the base of the jambs.

Both drawholes had similar arches consisting of oblong blocks of fieldstone set on their sides radially around the intrados. Each arch was supported by three iron bands 2 in. wide, 0.5 in. thick, curved to follow the arch and anchored into the jambs with short horizontal terminals (Fig. 17).

The side walls of the alcoves were only one stone thick and primarily served as facings rather than as functional, load-bearing walls. Behind these facings, in the gap between the two kiln walls, there were piles of unmortared rubble-stone which absorbed most of the lateral thrust of the earth packing and supported the ends of the arches over the alcoves. The lower portions of the side walls of the alcoves must have been built after the drawholes were completed, since in the north alcove the walls overlay the offset at the base of the jamb and abutted the back of the second kiln wall. However, the

15 The west passageway, alcove and drawhole of the second kiln. The vertical sides of the excavation are the sides of the original passageway.

15

upper part of the side walls above the top of the drawhole opening bonded into the back of the kiln wall. The implication is that the drawhole was built first, then the side walls of the alcove up to the top of the drawhole, then the upper part of the first stage of the kiln wall and the upper part of the alcove walls together.

The arches over both alcoves abutted the back of the second kiln wall, 1.6 ft. above the top of the opening on the north drawhole and 2.5 ft. above on the west drawhole. Both arches were built across the top of the side walls rather than springing from them, and rested partly on the piles of rubble behind. They were built with shallow arcs, the crown being only 4 in. to 6 in. above the springer, and were supported during construction by wooden scaffolding, the marks of which could still be seen in the mortar on the underside of the arch. Since these arches abutted the back of the kiln wall and since the

second vertical stage of the kiln wall rested on top of the arch in the west drawhole, they must have been constructed after the completion of the first stage of the wall and before the start of the second stage.

The breaches through the first kiln wall also must have been arched over, but only in the west drawholes was there any evidence of this. There the arch was still in place when excavation uncovered the top of the surviving wall. However, when the earth surrounding it was removed the arch collapsed into the empty space of the alcove below. All that was then left *in situ* were the springers which consisted of four courses of brick forming a stepped slope for the first stone of the arch on each side (Fig. 18). These bricks were laid partly on top of the side walls of the alcove where they faced off the jagged edge of the breach and therefore provided a *terminus post quem* for construction of the arch. It is unlikely that these arches were built at the same time as those over the alcoves since, although they were at the same level, there was no bond between them.

From the above evidence the following construction sequence for the drawholes and alcoves can be offered with some confidence.

1) Excavation of passageways through the hillside on the north and west.
2) Breaching the lower part of the first kiln wall in two places.
3) Building the jambs and arches of the drawholes, and the lower part of the first stage of the second kiln wall.
4) Erection of the side walls of the alcoves up to the level of the top of the drawhole openings.
5) Completion of the side walls of the alcoves and the first stage of the kiln wall together.
6) Placing the piles of fieldstone behind the side walls of the alcoves.
7) Construction of the arches over the alcoves.
8) Construction of the arches over the breaches.
9) Packing of earth between the two kiln walls.
10) Construction of the second stage of the kiln wall partly overlapping the arches of the alcoves.

The only stage in the construction sequence that can not be precisely placed is the laying of the fieldstone sills of the drawholes. It must have been after the erection of the jambs since there is no bond between the two, but there is no *terminus ante quem* for their construction. Probably they were laid at the same time as the floor of the kiln, which may have been the last stage in construction.

The Southeast Drawhole

The sequence of construction at the southeast drawhole (Fig. 16) was somewhat more complicated because the opening of the first kiln had to be demolished before the new drawhole could be built.

As noted earlier, all that remained of the opening was the base of the jambs and the brick sill, which were presumed to have survived the modifications because they were hidden below the existing surface. Everything above was demolished to make way for a wider approach to the drawhole. Removal of the jambs, and therefore of the arch of the opening of the first kiln, probably also involved demolition of the arch over the arms, but since nothing of this arch survived it is not possible to be certain.

Following the demolition of the opening, the next stage in construction was the laying of the first two courses of the kiln wall beneath the sill. Probably this was done to bring the base of the jambs up to the same level as the others, since the floor of the first kiln on which this was being built was lower at this point than elsewhere.

The next task was the erection of the brick jambs with an offset on the outside. This offset was probably designed as a door check for a removable door that served to control the flow of air into the kiln.

The arch of this drawhole was different from the others since it did not have supporting iron bands (though these may have been removed), and the stones of the arch were laid on end rather than on their sides. With the sill in place, the opening was the same width as the others but approximately 6 in. higher. Since the side walls of the alcove abutted the back of the kiln wall, they must have been built later, as in the other alcoves. The demolition of the jambs of the first entrance exposed the core of the wall behind, so the side walls were built, as in the other alcoves, as a one-course-thick facing between the two kiln walls and over the jagged edge of the core, but in this case continuing outward to bond into the area

16 The southeast drawhole of the second kiln. There are no iron bars supporting this arch.

16

of undisturbed facing on the arms. The alcove was further widened by changing the direction of the north side wall of the alcove so that it joined the wall of the second kiln clear of the drawhole (Fig. 9). As with the other alcoves the main thrust from the earth packing was taken by piles of rubble-stone behind the side walls. No doubt there was also an arch over the alcove resting on these stones, but nothing of this remained when excavated.

Presumably, the construction sequence continued in the same way as for the other alcoves, possibly ending with the reestablishment of an arch across the arms creating an alcove 9 ft. long. Finally, the floor of the alcove was raised one foot by the addition of a deposit of red, stony clay/loam, C horizon material. This resulted in a floor level 1.3 ft. below the sill of the drawhole. On top of this there was a thin spread of lime and above that the alcove was filled with rubble collapsed from the arches and walls. Approximately 6 in. from the drawhole, on the floor of the alcove, there was a wooden beam laid crossways with both ends running just under the side walls. Its function is uncertain, but it may have been a joist for a wooden platform in the alcove and passageway.

Passageways

The North and West Passageways

The north passageway could not be fully excavated because it ran under the present, and only, access road into the fortress. Excavation, therefore, had to stop approximately 5 ft. short of the road to avoid subsidence.

17 Iron bands supporting the arch of the west drawhole.

17

Consequently, only 6 ft. or so of the passageway was uncovered. The floor of the passageway was found at an elevation of 9 ft. above sea level. A wooden platform covered the bottom of the passageway but did not extend into the alcove. Although almost completely decomposed, it was possible to detect in the wood a pattern of planking running parallel to the sides of the passageway, resting on joists anchored by dovetail joints to sleepers along both sides. Mortices were cut in the top of the sleepers to take upright posts only the stumps of which survived. On top of the wood were scattered deposits of lime that had probably been dropped when the kiln was being unloaded.

The west passageway was similar but the sides and the wooden platform were much better preserved and were more easily accessible, except at the outer end where a modern building had been constructed with

18 Brick springer of the arch over the breach for the west alcove.

18

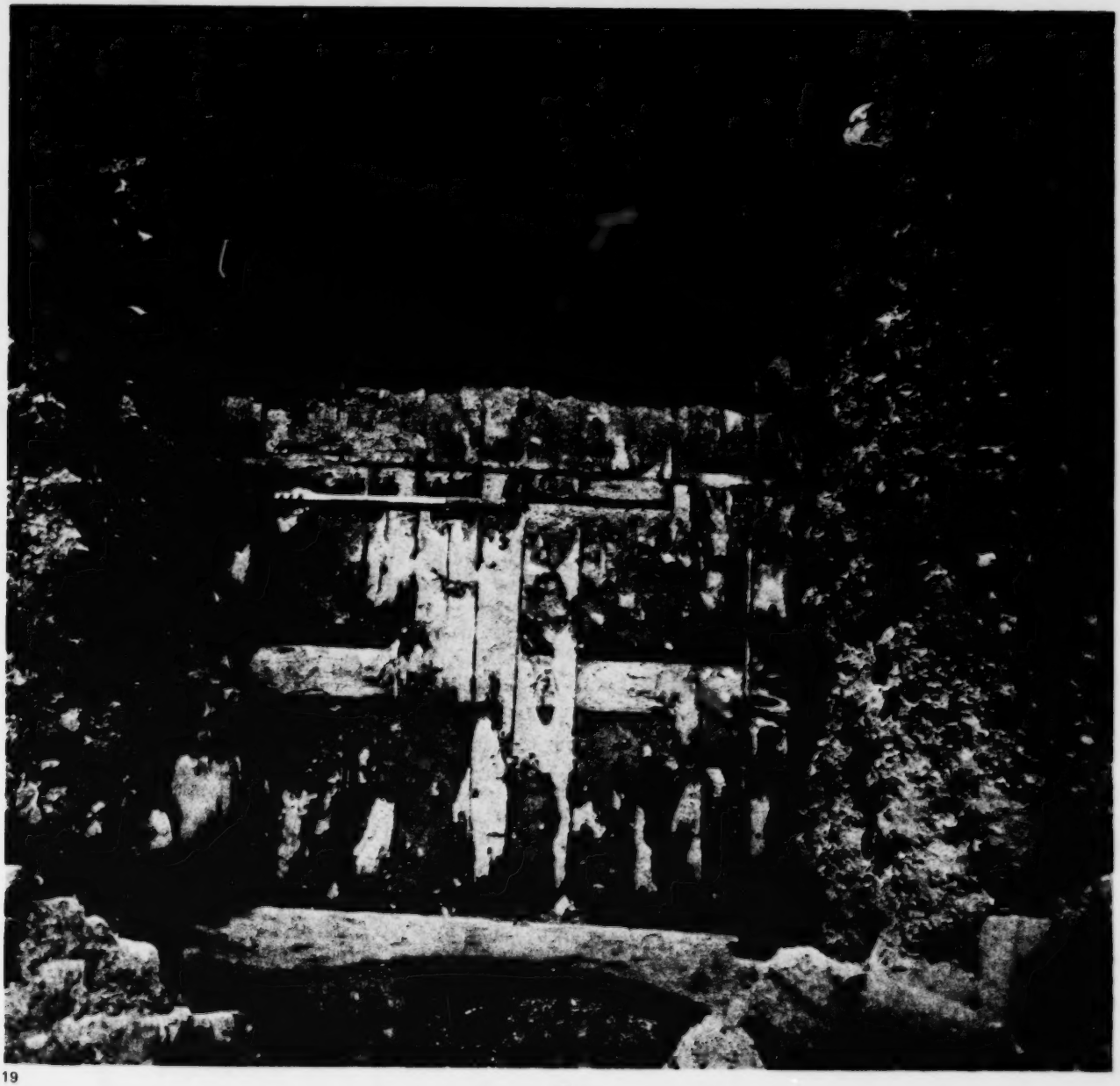
its foundations dug down almost to the floor level of the passageway.

The passageway was 9 ft. wide at the alcove and 15 ft. wide at the other end of the wooden platform that occupied most of the floor space (Fig. 19). This floor was at an elevation of 10.2 ft. above sea level, 9.8 ft. below modern ground surface at the kiln wall and 7.75 ft. below at the outer end of the platform. Originally the depth of the floor below surface level would have been greater, but since the original height of the bank around the kiln was unknown, the exact depth could not be calculated. The length of the passageway was also not calculable because the foundations of the modern house cut into the outer end. However, the modern ground surface near the house sloped away toward the south and the slaking pits (*see* Slaking at Louisbourg), so the passageway probably was approached from this direction. The floor of the passageway continued some way beyond the end of the wooden platform, but there was nothing to indicate the floor level except the rising junction of the undisturbed subsoil and the loose fill on top.

This passageway had a planked floor 26 ft. long, gradually widening from 8.5 ft. near the alcove to 14 ft. at the outer end. The framing of the floor consisted of sleepers along both sides and six joists dovetailed into them at 4 ft. intervals. The sleepers each consisted of three lengths of 10 in. by 10 in. wood, 7 ft., 12 ft. and 7 ft. long. The outer end of each sleeper had one-half of a shiplap joint with two holes cut vertically through it, but no indication of a joist joining the two sleepers. However, it is possible that the wood used in this floor was previously used elsewhere, which would explain this and other aberrant features such as notches and holes found in the surface of the wood. The joists were also 10 in. by 10 in. and their dovetailed joints were held in place by two treenails driven through the lap. Remains of floor planking lay on the joists. This planking was laid parallel to the sides of the passageway. The width of the planks varied, those in the centre being over one foot wide and those along the sides being 10 in. wide. In the middle of the passageway 10 planks were needed to cover the width of the floor. Because of the wedge shape of the passageway, the centre planks had a slight taper toward the kiln. No complete planks were found, but the longest surviving piece was over 8 ft. long.

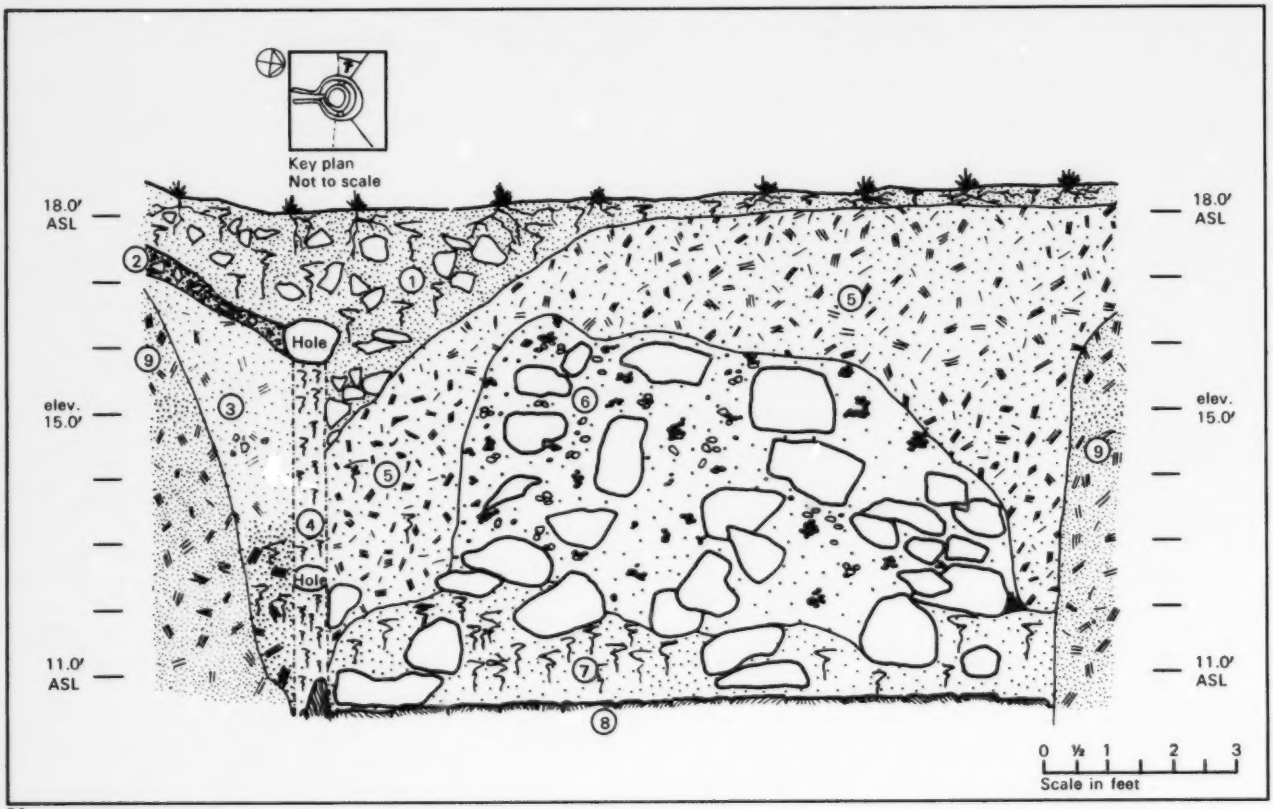
Mortices for tenoned uprights were cut in the tops of the sleepers at slightly irregular intervals, but averaging 2 ft. centre to centre. These were 12 in. long and 2 in. wide and were set near the inner edge of the joists. Some of the mortices still had the stumps of tenons in them, though the uprights themselves had completely decomposed with the exception of one very fragile piece. The last mortice on each sleeper, about one

19 Part of the wooden floor of the west passage-way.



19

20 Section through the west passageway. *1*, turf and humus (topsoil); *2*, dark brown organic layer (buried turf line? original bank surface); *3*, light brown sandy loam, traces of organic matter near base (fill behind wood revetment); *4*, black organic matter (profile of decomposed wood revetment); *5*, clay-loam, patches of organic matter, burnt in places; *6*, mass of beach gravel, rocks; *7*, black organic matter mixed with sand; *8*, planking on floor of passageway; *9*, yellow, hard-packed, stony, sandy loam, weathered C horizon (vertical edges represent sides of passageway).



20

foot from the outer end of the platform, contained the remains of a slanting post for a sloping end to the wooden revetment of the passageway. These posts, and presumably the rest of the framing, were 12 in. by 6 in. It is not certain why the mortices were cut near the inner edges of the sleepers, but such an arrangement would have allowed some batter to the revetment to follow the slope of the earthen sides of the passageway. In some places along the inner edge of the sleepers, traces of the plank sheathing set on edge were found.

The fill of the passageway consisted of a loose mixture of stone, sand, gravel and loam which was the unconsolidated, redeposited version of the weathered, yellowish surface of the C horizon through which the passageway had been dug (Fig. 20). Most of the fill was probably thrown in from the banks by the French, when they were razing the kiln during the second siege. Thus, on the floor of the passageway there was a large deposit of boulders, presumably from the upper part of the kiln wall.

The sides of the passageway could be easily distinguished from the fill since the former were very compacted, almost concreted. The

21 Floor of the second kiln.

trench sides seen in Figure 15 are the actual passageway sides, which accounts for both their unevenness and their uprightness. The remarkable preservation of the sides of the passageway must have been due to immediate filling; if it had been left open for even one winter the sides would have eroded to a shallow slope.

The Southeast Passageway

Most of the features of the southeast passageway have been discussed in connection with the first kiln, few modifications being necessary for the second. Raising the floor of the alcove and passageway by approximately 12 in. blocked off the drain leading from the passageway which was presumably no longer considered necessary now that the floor level was above the water table.

The other major modification was the addition of a dry-stone wall across the south end of the passageway. This wall abutted the side walls of the passageway and sat on top of the raised floor. The rubble from the passageway walls was resting against this wall, so it must have been built before the destruction of the kiln. Although the wall obviously must have belonged to the kiln, its function is rather obscure since it blocked off access to it. However, as Figure 9 shows, the wall was built with a separate centre section about 2 ft. wide. Two vertical joints can be seen, and behind this centre section of the wall the old ground surface was found to slope gradually upward, whereas behind the wall on either side there were banks of earth. This section of wall, therefore, was removable. Probably when the kiln was not in use, the entrance was blocked with this dry-stone wall.

21

The Floor

The floor of the second kiln was unique, there being no parallel in the available historical sources. It indicated a radical departure from the firing method used in the previous kiln.

Occupying most of the floor were the remains of a circular fieldstone pillar 5 ft. in diameter (Fig. 21). Leading from the pillar were three ridged arms extending to the wall of

the kiln midway between each of the drawholes. This arrangement created stone-lined, arc-shaped depressions 5 ft. long and 1.8 ft. wide immediately inside each drawhole. There were soot marks on the sides of these hollows that reached a point above the surviving remains, indicating that originally the pillar and arms were approximately the same height as the top of the arches.

Conclusions

While in detail the second kiln appears to be unique, it has a definite generic relationship with the running kilns of Flanders and the Rhône valley. Points of similarity include the double wall (which may have been the specific reason why this kiln was built within the first), the inverted cone shape, the three drawholes, the iron bands supporting the arches of the drawholes, and the covered passages or alcoves leading to them. Specifically related to the Rhône valley kilns are the materials used to build the kiln – local fieldstone set in mortar – and the pillar occupying the *cendrier*. The major differences include the arms radiating from the central pillar of the floor and the absence of the loading ramp. Both these differences can be explained by examining the specific circumstances of this kiln. First, the kiln was basically subterranean and therefore needed no loading ramp since the banks and the hillside would serve for this purpose. Second, the kiln illustrated by Diderot (Fig. 5) had a floor only 2 ft. in diameter which could easily be spanned by iron bars. In contrast this kiln was over 7 ft. in diameter at floor level. Iron bars spanning this gap would have had to be massive to take the weight of the load and resist the buckling effect of the heat. To circumvent this problem the builders provided a central pillar and radial arms to support much smaller grille bars above each drawhole, and thus still retained the same method of operation as shown by Diderot. The load would be placed on top of the grilles which could be removed when drawing the lime. In addition, the central pillar would help to funnel the lime to the drawholes as in the Rhône valley kilns. A minor specific difference is the absence on this kiln of horizontal cross-bars at springer level in the drawholes, but this could easily be compensated for by varying the arrangement of the bars of the grille.

A clue exists that may explain why this particular type of kiln was built at Louisbourg. In 1752, Rouille, the Minister of Marine in France, wrote to Franquet, the king's engineer at Louisbourg, that he was sending him the designs of kilns from the Tournay, Anjou and Rhône regions of France.[1] Perhaps one of these designs was the inspiration for this kiln.

The second kiln, therefore, represented a departure from the earlier one not only in design and capacity but also in method of operation. The change from a relatively simple periodic kiln to a sophisticated continuous kiln, exhibiting evidence of ingenuity on the part of the builders, strongly suggests that whoever built the second kiln was well versed in the art of lime-burning. This is in obvious contrast to the previous attempts at building lime-kilns at Louisbourg, about which numerous records remain attesting their poor quality, restricted capacity and functional inefficiency.

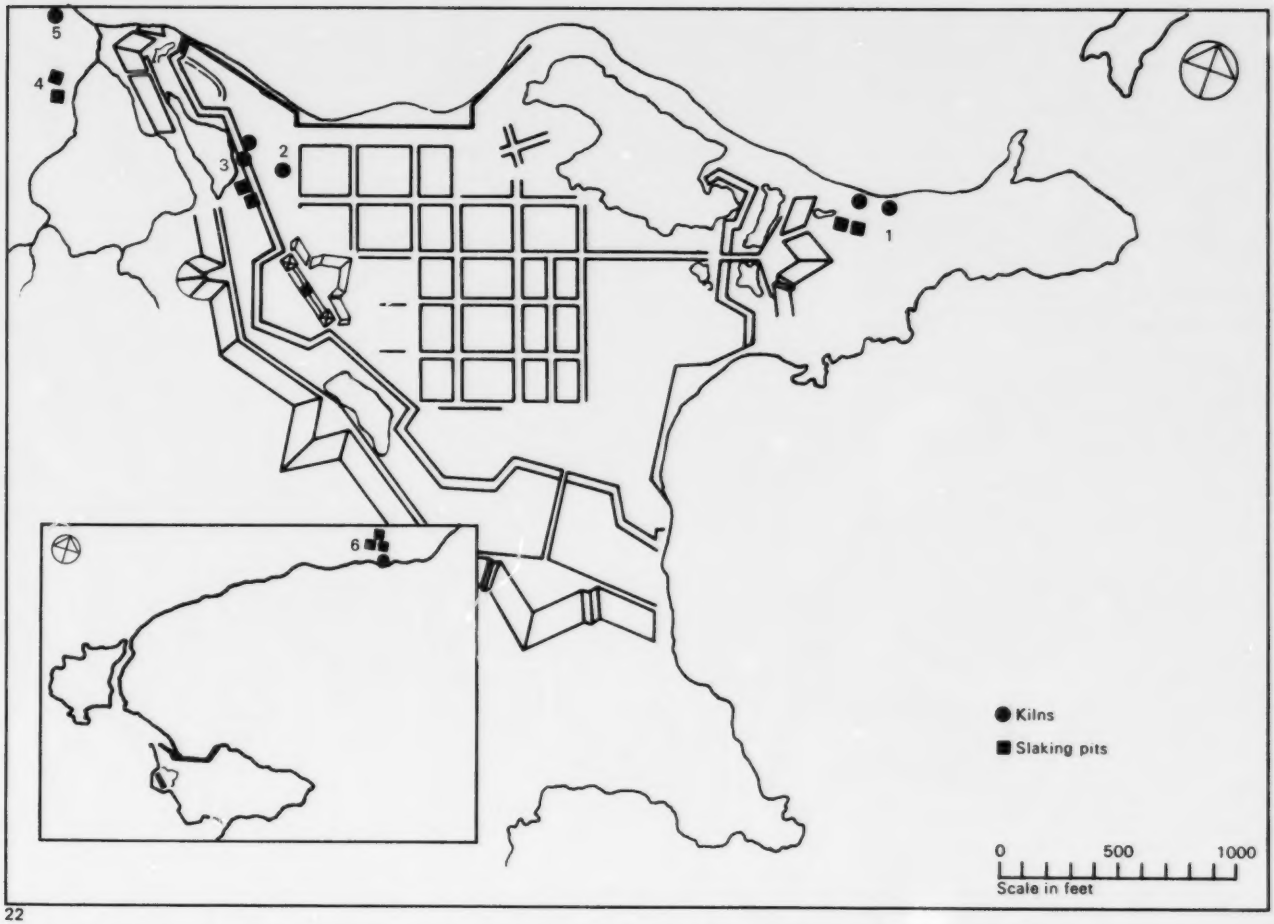
Other Lime-kilns at Louisbourg

At least six lime-kilns besides the one in the *faubourg* are known to have existed at Louisbourg during the French occupation (Fig. 22). In probable chronological order they are:

1) Two lime-kilns (Fig. 23, *a*) built astride the line of the King's-Dauphin curtain. These were built for the construction work on the King's Bastion and Barracks, and had been demolished by the time the curtain wall was begun in 1735. Nothing is known about the kilns beyond the plan drawings and the accompanying view (Fig. 23, *b*). Except that they were square based, not circular, they appear to be standard types as shown in Figure 1, *3, 4,* good examples of kilns erected near the site of the construction work.

2) The Royal Battery lime-kiln depicted in a detailed view of the construction work there in 1725 (Fig. 23, *c*). The view shows the top of the kiln projecting approximately 6 ft. above the surface, and also shows the slaking pits. The date of destruction of this kiln is not known, but it prob-

22 Distribution map of lime-kilns and slaking pits at Louisbourg. *1*, Rochefort Point kilns and slaking pits; *2*, kiln near Block 46; *3*, King's-Dauphin Curtain kilns and slaking pits; *4*, possible slaking pits for Faubourg kiln; *5*, Faubourg kiln; *6*, Royal Battery kiln.



22

ably was abandoned when construction of the battery was finished.

3) A lime-kiln built about 1737 just behind the King's-Dauphin curtain west of Block 1 inside the town (Fig. 23, *d*). This kiln seems to have been built to replace those that had been astride the King's-Dauphin curtain. The owner of a nearby house, Joseph Lartique, complained that the fumes from the kiln were ruining his health; however, since this was the only lime-kiln in operation at Louisbourg at the time, he had to put up with the inconvenience.[1] The lime-kiln was excavated in 1967 by William A. Westbury, and was found to be a simple circular structure (Fig. 24). All that remained was that part of the kiln that had been subterranean. The kiln was 23 ft. in over-all diameter, with a wall 3.5 ft. thick, creating a furnace 16 ft. in diameter. On the north side the wall thickened out at the drawhole, the sill of which was 3 ft. above the

23 Historical drawings of lime-kilns at Louisbourg. *a* and *b*, show lime-kilns astride the King's-Dauphin curtain. Taken from a plan entitled "Plan Pour Servir au Projet Representé en Jaune du Revetment du Quay du Port de la Ville de Louisbourg en l'isle Royalle." 1731 *(Archives du Génie)*; *c*, shows the Royal Battery lime-kiln. Taken from a plan entitled "Plan de la Batterie Royale Avec Ses Environs Pour Servir au Projet de 1726" *(Archives Nationales)*; *d*, shows the kiln west of Block I. Taken from a plan entitled "Partie de la Ville de Louisbourg" *(Archives Nationales)*; *e*, shows the lime-kilns at Rochefort Point. Taken from a plan entitled "Louisbourg 1752: Plan de la Pointe à Rochefort" *(Archives Nationales)*; *f*, shows one of the Rochefort Point kilns. Taken from a plan entitled "Plan du Cap breton dit Louisbourg Avec ces environs Pries par Lamiralle Bockoune le 26 juillet 1758" *(Library of Congress)*.

a

b

c

d

e

f

23

dirt floor of the kiln. Outside, the ground surface had been 5 ft. above the floor, so the stone-lined passageway to the drawhole was approximately 2 ft. below ground level.

A U-shaped iron band with short horizontal terminals at either end lay on the floor of the kiln. The length from apex to terminal was 2 ft. This band would have adequately served as a support for the arch of the drawhole.

From the remains this kiln appears to have been very similar to the flare kilns from Provence (Fig. 3, *a*). The floor some distance below the sill level, the shallow sunken passageway, the cylindrical furnace and the free-standing walls all point to the Provence kilns as the prototype for this one.

4) Two kilns at Rochefort Point, outside the eastern defences of the town, have a rather vague history both in place and time. Various maps show the kilns at different places, but the most probable site is near the harbour side of the point on a low rise to the east of the pond in front of the Maurepas Bastion (Fig. 23, *e*). Although the erection of these kilns was proposed in 1738, they do not appear on any plans until 1745 but are described as "old lime-kilns" in 1746.[2] They were still in existence in 1758, but it is not known whether they were still in operation at that time. An interesting, if somewhat impressionistic, view of the area in 1758 shows one of these lime-kilns (Fig. 23, *f*). In appearance it is almost exactly similar to that in Figure 1, *11*, but seems to be free-standing rather than subterranean.

Little is known about the operation of lime-kilns at Louisbourg, though something can be inferred from incidental remarks by Franquet in letters to the Minister of Marine in France.

In a highly critical account of the cost of lime-burning, Franquet, in 1751, stated that the lime-kiln (at this date almost certainly one of those at Rochefort Point) was badly built, would hold only 2.25 cubic *toises* of limestone, and was poorly serviced by the soldiers.[3] This same account describes payments made to the soldiers for operating the kiln. They were paid for, among other things, constructing an arch in the kiln 5 *pieds* high and capable of taking the weight of the limestone. This indicates that the kiln was being fired as a flare kiln. In a later passage he notes that if the kiln were well-built, it would not need such an arch, suggesting that he thought that a "well-built" kiln should be fired as a running kiln. The soldiers were also paid for breaking the stone, loading the kiln, watching and feeding the fire day and night and removing and slaking the lime. Three men were occupied at this task for 11 days and the 4 nights when the fire was alight and had to be constantly tended.

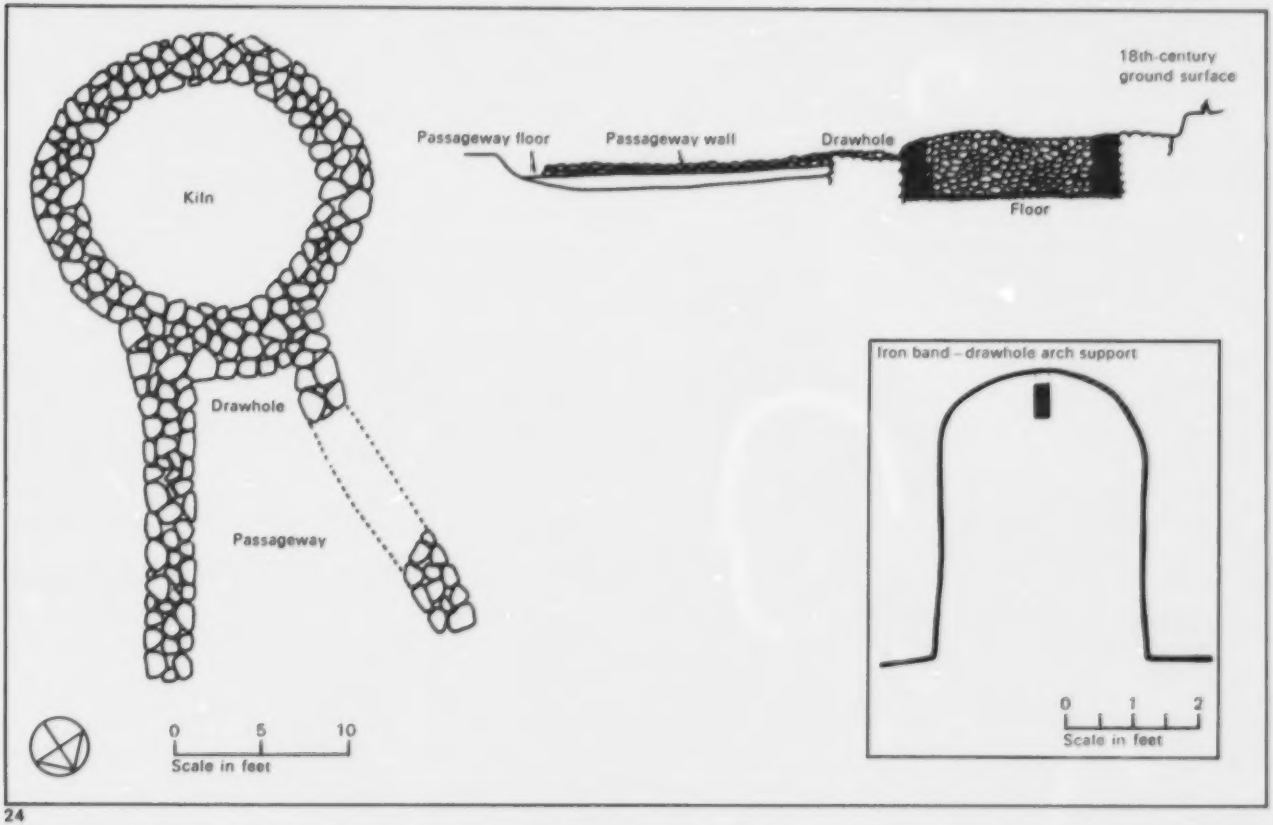
Franquet's major complaint about the lime-burning was centred around the incompetence of the men operating the kiln. He noted that as much as one-fifth of each load was unburned because the stone was not properly broken and loaded, so the heat could not penetrate completely. Also the arch, being badly built, often collapsed during the firing, ruining the load of limestone.

Documentary and archaeological evidence show that both wood and coal were used as fuels at Louisbourg. In 1718 it was noted that mortar used in waterlogged areas was mixed with the ashes from the coal with which the lime was burnt.[4] In 1752, Franquet suggested as an economy measure that coal be used for burning the lime instead of wood and fascines as had been used at the Royal Battery kiln.[5] The surface of the passageway to the entrance of the first kiln in the *faubourg* was covered with crushed charcoal fragments. The ground surface outside the passageway, on top of the continuation of the raised floor level to the second kiln, contained, among some boulders of partly burnt limestone, some fragments of coal and charcoal. Since secondary sources suggest that coal is used only in running kilns, the appearance of coal fragments associated with the second kiln reinforces the argument for interpreting this as a running kiln.

Since the cost of lime had risen from 4 *livres* per barrel in 1725 to over 8 *livres* per barrel in 1751, Franquet wanted to initiate savings which he suggested could be made by the use of coal instead of wood, burning the lime at the limestone quarries, and slaking it before transport to the construction site. Since the limestone quarries were at Spanish Bay (Sydney), 26 miles away, and Main-à-

24 Remains of the excavated lime-kiln west of Block I.

25 Historical drawings of slaking pits at Louisbourg. *a*, shows a slaking and a storage pit for the kilns astride the King's-Dauphin curtain. Taken from a plan entitled "Plan de Louisbourg Avec Ses Augmentations faites pendant l'année 1720" *(Archives du Génie)*; *b*, pits for the same kilns 11 years later. Taken from a plan entitled "Plan Pour Servir au Project Represen-



24

Dieu, 12 miles away, the transport of liquid lime would have been a major problem. Nonetheless, Franquet insisted that it could be done after the lime had been allowed to settle a little. We do not know whether Franquet succeeded in convincing the minister of the feasibility of his scheme.

Slaking at Louisbourg

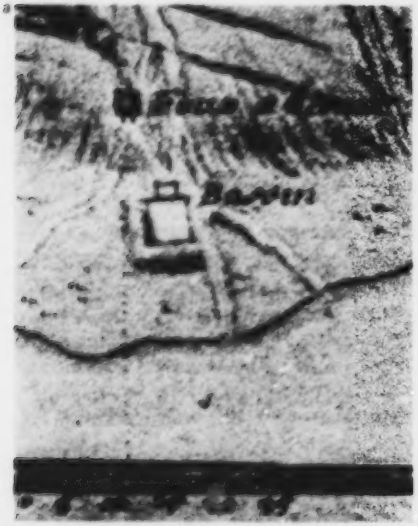
There is virtually no documentary evidence concerned with slaking at Louisbourg; however, an early report to France on work to be done at Port Dauphin, where lime was quarried for Louisbourg construction projects, mentions the erection of kilns for burning the lime there and the digging of slaking pits. The report states that the lime would be slaked in small pits to turn it to a milky texture which would then be poured into storage pits 18 *pieds* square and 4 *pieds* deep.[1]

Some plans depict slaking pits at Louisbourg, though it is not always possible to determine the type.

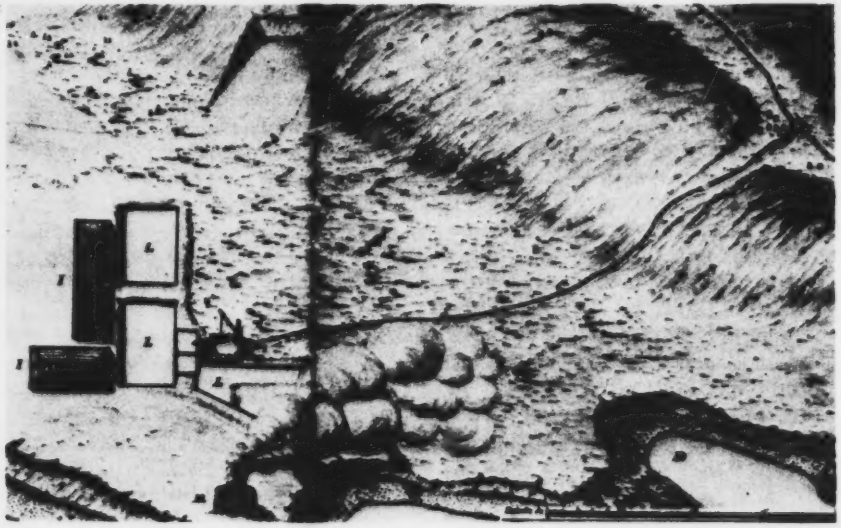
1) A plan drawn in 1720 shows a lime-kiln astride the King's-Dauphin curtain line with a storage pit and a slaking pit (Fig. 25, *a*). The larger pit, approximately 28.0 ft. by 24.0 ft., is joined to the smaller pit at its southern end. This arrangement is precisely that described by Blondel, the smaller pit being the place where the

té en Jaune du Revetment du Quay du Port de la Ville de Louisbourg à l'isle Royalle, 1731" *(Archives du Génie)*; *c*, shows two slaking pits and three storage pits at the Royal Battery. A stream (C) has been canalised to run water to a small pond near the slaking pits from which the water was hoisted by bucket into a chute which directed it into the slaking pit. Taken from a plan entitled "Plan de la Batterie Royale Avec Ses Environs Pour Servir au Projet de 1726" *(Archives Nationales)*; *d*, shows two pits for the Rochefort Point kilns. Taken from a plan entitled "Louisbourg 1752: Plan de la Pointe à Rochefort" *(Archives Nationales)*; *e*, shows two pits described as "Old Tann pits" near the pond outside the Dauphin demi-bastion. They were probably lime-slaking pits, since there was no tannery at Louisbourg. Taken from a plan entitled "A Plan of Louisbourg Survey'd and Drawn for His Excellency the Honble. Major General Thos. Gage Commander in Chief of His Majesty's Forces in America," 1767 *(Public Archives of Canada)*.

a



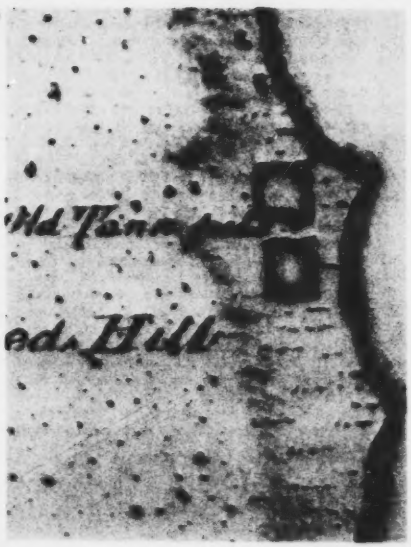
c



b

d

e



25

slaking was carried out and the larger one being a reservoir. Water for slaking could be obtained from the nearby pond. A later plan, drawn in 1731, shows two large pits and no small slaking pit (Fig. 25, *b*).

2) A plan drawn in 1725 of the lime-kiln and slaking pits at the Royal Battery again shows small pits for slaking connected to larger storage pits (Fig. 25, *c*). In this case there are two large (30 ft. by 20 ft.) conjoined rectangular storage pits to the west of the two small slaking pits, and one irregular storage pit to the east. There does not appear to be any connecting channel between the two rectangular pits, though this may have been below the surface. Leading in from the east was a canal dug to bring water down to a small pond next to the slaking pits. Here a frame was erected with a pivoting arm, on one end of which was a rope attached to a bucket. The bucket was dipped into the pond, then raised and the water tipped into a trough standing on trestles which conveyed the water into the slaking pit.

3) A third plan drawn in 1752 (Fig. 25, *d*) shows two pits approximately 150 ft. from the two kilns near Rochefort Point. The pits are both the same size, beside each other, and without slaking pits attached. This simplicity is probably to be attributed to the schematic nature of the plan.

4) There are no indications either in the documents or on the plans of slaking pits for the kilns in Block 1 and in the *faubourg*. In the *faubourg* two rectangular depressions approximately 250 ft. southwest of the kiln may have been storage pits, though they do not appear on any plans until 1767, when they are described as "Old Tann Pits" (Fig. 25, *e*), a mistaken identification probably derived from the use of lime in the tanning process. There was no tannery at Louisbourg at this time.

Limestone used at Louisbourg

The first limestone used at Louisbourg was obtained from Port Dauphin (St. Anne's Bay), 55 miles away. This was a thin-bedded carboniferous limestone of the Windsor group and was the same as the limestone discovered at Mira (12 miles away) in 1726 which gradually replaced that from Port Dauphin.[1] Apparently the limestone was suitable for construction work at Louisbourg since no complaints were made about it during the early years. The hydraulic qualities of thin-bedded carboniferous limestone were particularly useful at Louisbourg, where much of the construction was in waterlogged areas.

In 1733 quarries were opened at Spanish Bay.[2] In 1809, Thomas Patience described the limestone from these quarries as dull blue in colour, burning to a pale colour similar to Dorking lime, a high quality English hydraulic lime.[3] Yet Franquet complained that the large amount of grit in the lime prevented it from bonding properly with sand.[4]

Preface

1 Artifacts recovered from the excavation were not considered for this paper since none of any significance was found in stratigraphic contexts.

Lime Preparation in France

1 C. M. Gay, H. Parker, and J. W. McGuire, *Materials and Methods of Architectural Construction* (New York, John Wiley and Sons, 1961), pp. 16-20.

2 Bibliothèque du Génie, MS 131d, Vol. 2, n.d. "Du Second Livre des fortifications du sieur Masse . . . ," (based on a treatise written in 1728).

3 Fourcroy de Ramecourt, *Art du Chaufournier* (Paris: n.p., 1766), p. 51.

4 *Encyclopédie; ou Dictionnaire raisonné des sciences, des arts et des métiers, par une société de gens de lettres* (hereafter cited as *Encyclopédie*) (Paris: Briasson, 1751-65), Vol. 3, p. 263." Il y a des endroits où l'on se contente de pratiquer des trous en terre, où l'on arrange les pierres à calciner, les unes à côté des autres; on y pratique une bouche & une cheminée; on recouvre les trous & les pierres avec de la terre glaise; on allume au centre un feu qu'on entretient sept à huit jours, & lorsqu'il ne sort plus ni fumée ni vapeur, on présume que la pierre est cuite."

5 *Encyclopédie*, Planches, Vol. 1, Architecture, Maçonnerie, pl. VIII.

6 Anonymous, *Architecture rurale, théorique et pratique, à l'usage des propriétaires et des ouvriers de la campagne* (hereafter cited as *Architecture rurale*) (Toulouse: Douladoure, 1820), p. 249.

7 Bibliothèque du Génie, MS 131d, Vol. 2, n.d., n.p." Du Second Livre des fortifications du sieur Masse . . . ,"

8 Fourcroy de Ramecourt, op. cit., p. 9.

9 Ibid., p. 62.

10 Anonymous, *Architecture rurale*, p. 250.

11 Raucourt de Charleville, *Traité sur l'art de faire de bons mortiers . . .* (Paris: Malher, 1828), pp. 133-4. "Quelle que soit la grandeur du four à chaux, il faut toujours commencer le chauffage à très-petit feu, principalement pour les fours neufs.

La nature de la pierre qui souvent éclate lorsque le feu la saisit, la nature du bois peut faire varier la durée du chauffage à petit feu, de douze à quarante-huit heures.

Dans le premier instant du feu la pierre se mouille, l'eau qui en sort couvre sa surface, ce n'est que huit à douze heures après un feu léger et continu qu'elle est complétement séchée, alors la fumée s'attache après la pierre, qui devient noire; on doit augmenter un peu l'intensité du feu et le conserver au même degré, jusqu'au moment où la fumée est entièrement consumée, ce dont on s'aperçoit parce que la pierre reprend sa couleur; dès-lors on peu sans inconvénient, augmenter par degré l'intense du feu, et le porter au plus haut point.

On gradue l'intensité du feu à peu prés comme les nombres 1, 2, 3, 6; si bien qu'aprés trente-heures il a toute la force possible . . . .

L'on reconnaît que la chaux est cuite lorsque le haut du four ne donne plus de fumée, lorsque la fournée de chaux s'est affaissée d'environ du sixième de sa hauteur totale, et que l'intérieur de la masse de pierre est d'un beau rouge vif et rose-blanchâtre. Tous les degrés de feu que nous venons d'indiquer, se reconnaissent encore par la couleur de la flamme qui s'échappe à la partie supérieure du four. En général elle paraît d'abord noire, brune ensuite rouge, après violette, enfin bleue, et elle finit par être jaune et blanche, c'est-à-dire à peine visible."

12 *Encyclopédie*, Vol. 3, p. 262.

13 Fourcroy de Ramecourt, op. cit., p. 19.

14 Raucourt de Charleville, op. cit., pp. 136-8.

15 Ibid.

16 *Encyclopédie*, Vol. 3, p. 262.

17 Fourcroy de Ramecourt, op. cit., p. 12.

18 Per Kalm, *Travels into North America . . .*, trans. by John Reinhold Forster (London: printed for the editor, 1771), p. 173.

19 Bibliothèque du Génie, MS 131d, Vol. 2, n.d., n.p. "Du Second Livre des fortifications du sieur Masse . . ."

20 Fourcroy de Ramecourt, op. cit., p. 8.

21 Ibid., p. 8.

22 *Supplément à l'Encyclopédie* (Amsterdam: M. M. Rey, 1776-77), Vol. 2, p. 376." Arrange trois ou quatre brassées de bois bien sec, qu'il recouvre d'un lit de trois ou quatre pouces de houille en morceaux gros comme le poing . . . Alors le *chaufournier* reçoit un panier rempli de ces pierres . . . & jette les pierres sur le lit de houille . . . il range grossièrement ces pierres, le plus souvent avec son pied . . . ensorte qu'elles recouvrent toute la houille. Sur ce lit de pierres, qui s'appelle une charge, & qui peut avoir trois à quatre pouces au plus d'épaisseur, il étend un lit de houille, ou une charbonnée . . . Le chaufournier répete la même manoeuvre des charges & charbonnées alternatives, jusqu'à ce que le four soit totalement rempli. Il observe seulement de faire les charges un peu plus épaisses, à mesure qu'elles s'élevent, & sur-tout vers l'axe du four, où le feu est souvent le plus actif."

23 Ibid., p. 377. "Pour l'allumer, on jette dans le cendrier une botte de paille que l'on y charge de quelques morceaux de bois sec: on observe de choisir celle des gueules, sur laquelle le vent souffle le plus directement. Si le vent étoit trop violent, on boucheroit celles des autres gueules, par lesquelles la flamme sortiroit du cendrier. En quelques minutes, le bois qui est sur le grillage se trouve enflammé: lorsqu'il l'est suffisamment, & que la fumée commence à sortir par le sommet du four, on bouche toutes les gueules avec des pierres & de la terre ou des gazons, afin que le feu ne s'éleve pas trop vîte."

24 Raucourt de Charleville, op. cit., p. 151.

25 Fourcroy de Ramecourt, op. cit., p. 38.

26 Ibid., p. 44.

27 Ibid., pp. 46-8.

28 Ibid., p. 46.

29 John L. Cotter, *Archaeological Excavations at Jamestown*, Archaeological Research Series, No. 4 (Washington: U.S. National Parks Service, 1958), pp. 89-91.

30 Fourcroy de Ramecourt, op. cit., pp. 49-51.

31 Jacques François Blondel, *Cours d'architecture, ou traité de la décoration, distribution et construction des bâtiments: contenant les leçons données en 1750, & les années suivantes. par J. F. Blondel . . . dans son école des arts.* (Paris: Desaint, 1777), Vol. 5, p. 182. "La meilleure maniere d'éteindre la chaux, est de mettre dans une fosse la quantité de pierres à chaux vive que l'on croit devoir employer, après les avoir concassé avec une masse, pour les réduire en morceaux à peu près égaux, afin qu'elles puissent s'éteindre uniformément. Il faut ensuite couvrir la chaux également par tout d'un pied ou deux de bon sable, & jetter sur ce sable autant d'eau qu'il en faut, pour qu'elle soit suffisamment abreuvée, & qu'elle puisse s'éteindre ou se fuser sans brûler: si le sable se fend & donne passage à la fumée, on recouvrira sur le champ les crevasses de nouveau sable: cela fait, on peut laisser reposer cette chaux aussi longtems qu'on voudra; alors elle deviendra douce, grasse & admirable pour la Maçonnerie."

32 *Encyclopédie*, Vol. 3, p. 263.

33 Charles Etienne Briseux, *L'Art de bâtir des maisons de campagne où l'on traite de leur distribution, de leur construction & de leur decoration . . .* (hereafter cited as *L'Art de bâtir*) (Paris: Prault, 1743), Vol. 2, p. 38.

34 [Charles Etienne Briseux], *Architecture moderne; ou, l'art de bien bâtir pour toutes sortes de personnes, tant pour les maisons particuliers que pour les palais* (hereafter cited as *Architecture moderne*) (Paris: Jombert, 1728), p. 19.

35 Jacques François Blondel, op. cit., Vol. 5, pp. 182-84. "Afin de purger néanmoins la chaux vive des parties étérogenes qui peuvent s'y rencontrer, on prend des précautions à cet égard, pour l'exécution des ouvrages qui demandent un certain soin. On fait en conséquence deux bassins contigus d'inégales grandeurs, qui se communiquent par un conduit. Le plus petit, qui est en même tems le plus élevé, sert à broyer la chaux vive, & à retenir les corps étrangers qui peuvent s'y trouver; le plus grand est destiné à servir d'espèce de réservoir, propre à contenir une provision de chaux éteinte, proportionnée à la grandeur du bâtiment qu'il s'agit de construire. Afin de ne laisser passer dans le dernier bassin, que ce qui doit y être reçu, on a soin, non-seulement de mettre dans le conduit de communication, une grille de fer ou de bois, pour arrêter toutes les parties grossieres, mais encore de tenir le fond du petit bassin plus élevé du côté du passage; de maniere que les corps étrangers soient obligés d'y rester. Ces précautions étant prises, on nettoye bien le premier bassin, & on le remplit de chaux, sur laquelle on verse

d'abord un peu d'eau pour commencer à l'éteindre: à mesure que cette eau se boit, on continue à en verser d'autre, jusqu'à ce qu'elle soit absolument dissoute; après quoi on en verse encore pour achever de détremper la chaux, ayant soin de la remuer & corroyer fortement, pendant cette opération, avec un rabot de bois. Il faut prendre garde de mettre trop ou trop peu d'eau: car le trop d'eau noye la chaux ou diminue sa force; & le trop peu au contraire la brûle, détruit ses parties & la réduit en poussiere. La chaux comprise dans le petit bassin, ayant donc été tourmentée suffisamment, à diverses reprises, ou la laisse écouler d'elle-même dans le grand, en ouvrant la communication, & en continuant de l'agiter jusqu'à ce qu'il soit vuide. Après cela, on referme le passage, & on recommence successivement la même opération jusqu'à ce que le second bassin soit plein. Enfin quand la chaux ainsi détrempée, a pris un peu de consistance dans le grand bassin, on la recouvre d'un ou deux pieds de sable, pour pouvoir la garder à volonté, & l'employer à mesure qu'on en aura besoin, sans craindre qu'elle perde de sa qualité."

36 Charles Etienne Briseux, *L'Art de bâtir*, Vol. 2, p. 38.
37 *Encyclopédie*, Vol. 3, p. 263; Vol. 9, p. 823.
38 Raucourt de Charleville, op. cit., pp. 161-65.
39 Charles Etienne Briseux, *L'Art de bâtir*, pp. 38-9.
40 Raucourt de Charleville, op. cit., pp. 165-79.

Introduction to the *Faubourg* Lime-kiln

1 Archives Nationales (hereafter cited as AN), Section Outre-Mer, Atlas des Colonies, No. 49, "Partie de la Ville de Louisbourg," n.d.
2 At Louisbourg the A horizon normally consists of a relatively thin turf and humus zone with some development of a pale grey elluviated zone. Below this, the B horizon consists of a bright orange-brown, iron-enriched, sandy loam layer up to 12-15 inches thick. The C horizon consists of a hard-packed stony glacial till, pale pink in its unweathered state, but grading to yellow towards the weathered surface.
3 AN, Colonies, C^{11}A, Vol. 126, pièce 68, Franquet to Minister of the Marine, 4 November 1755.
4 Archives du Génie, Article 14, No. 1, pièce 43, "Remarques faites à Louisbourg relativement au remuement des Terres, a la Maçonnerie et aux boix qu'on y Employe pour le Service du Roy," 20 November 1751.
5 AN, Section Outre-Mer, Dépôt des Fortifications des Colonies, Ordre No. 236, "Journal du Siege de Louisbourg . . . ," 9 May 1758.
6 Dilys Francis, "The Mines and Quarries of Cape Breton Island During the French Period, 1713-60," Manuscript on file, National Historic Parks and Sites, Louisbourg, p. 36.

The Second Kiln

1 Bibliothèque du Génie, MS 205b, fols. 67-99, "Copie de la lettre de Monsieur de Rouillé au Sieur Franquet, 15 March 1752, avec les responses de Franquet," 25 May 1752.

Other Lime-kilns at Louisbourg

1 AN, Colonies, C^{11}B, Vol. 20, fols. 16-19, "Demandes Particulieres, conseil à Maurepas, Louisbourg," 1 April 1738, cited in Dilys Francis, op. cit., p. 31.
2 Huntingdon Museum, HM15411, "Plan of Louisbourg," 1746.
3 Archives du Génie, Article 14, No. 1, pièce 43, "Remarques . . . ," 20 November 1751.
4 Bibliothèque du Génie, MS 125, fol. 190, "Devis et conditions des ouvrages que le Roy a ordonné de faire executer au port de Louisbourg . . . ," 10 June 1718.
5 Ibid., MS 205b, fols. 66-9, Copie de la lettre de Monsieur de Rouillé au Sieur Franquet avec les responses de Franquet," 15 March 1752: 25 May 1752.

Slaking at Louisbourg

1 Bibliothèque du Génie, MS 125, fols. 31-2, "Devis de la fortifications que l'on fera au Port Dauphin . . . ," Port Dauphin, 1716.

Limestone used at Louisbourg

1 Ibid.
2 Dilys Francis, op. cit., p. 25.
3 Ibid.
4 Archives du Génie, Article 14, No. 1, pièce 43, "Remarques . . . ," 20 November 1751.

Primary Sources

British Museum. Department of Printed Books. Map Room.
King's Maps, CXIX, 92, Plan of the City and Fortress of Louisbourg [1745].

Canada. Public Archives. Map Division.
H240, A Plan of Louisbourg Survey'd and Drawn for His Excellency The Honble. Major General Thos. Gage Commander in Chief of His Majesty's Forces in America [1767].

France. Archives Nationales. Colonies.
C^{11}A, Vol. 126, fol. 71, Louisbourg 1752: Plan de la Pointe à Rochefort.
C^{11}B, Correspondance Générale, Ile Royale, 1712-1762.

France. Archives Nationales. Section Outre-Mer.
Atlas des Colonies, [n.d.]. Partie de la Ville de Louisbourg, No. 49; Plan de la Ville de Louisbourg en l'Isle Royale [1751], No. 3115.
Depôt des Fortifications des Colonies, No. d'Ordre 152, Plan de la Batterie Royale avec ses Environs Pour Servir au Projet de 1726.

France. Archives du Génie.
Article 14, No. 1, pièce 43, Remarques faites à Louisbourg relativement au remuement des Terres, à La Maçonnerie et aux bois qu'on y Employe pour le Service du Roy, 20 November 1751.
Article 14, No. 14, Plan de Louisbourg Avec Ses Augmentations faites pendant l'Année 1720.
Article 14, No. 22, Plan Pour Servir au Projet Representé en Jaune du Revetment du Quay du Port de la Ville de Louisbourg a l'Isle Royalle, 1731.

France. Bibliothèque du Génie.
MS 125, Isle Royale, 1716, 1717 et 1718.
MS 131d, Mémoire on traité de fortification.
MS 205b, Registre des lettres écrites de rapport au service des fortiffications de l'Isle Royale et du Canada, 1750-55.

Henry E. Huntingdon Library and Art Gallery, San Marino, Calif.
HM15411, Plan of Louisbourg, [1746].

United States, Library of Congress.
Plan du Cap Breton dit Louisbourg Avec ces environs Pries par Lamiralle Bockoune le 26 juillet 1758.

Secondary Sources

Anonymous
Architecture rurale, théorique et pratique, à l'usage des propriétaires et des ouvriers de la campagne. Douladoure, Toulouse, 1820.

Bailey, W.
"Lime Preparation at Jamestown in the Seventeenth Century." *William and Mary College Quarterly Historical Magazine*, 2d ser., Vol. 18, No. 1 (January 1938), pp. 1-13. Williamsburg.

Blondel, Jacques François
Cours d'architecture, ou traité de la décoration, distribution et construction des bâtiments: contenant les leçons données en 1750, & les années suivantes, par J. F. Blondel . . . dans son école des arts. Desaint, Paris, 1771-77. Vol. 5.

[Briseux, Charles Etienne]
Architecture moderne; ou, L'art de bien bâtir pour toutes sortes de personnes, tant pour les maisons des particuliers que pour les palais. C. Jombert, Paris, 1728. 2 vols.

Briseaux, Charles Etienne
L'Art de bâtir des maisons de campagne où l'on traite de leur distribution, de leur construction & de leur décoration . . . Prault, Paris, 1743. Vol. 2.

Cotter, John L.
Archaeological Excavations at Jamestown. Archaeological Research Series, No. 4. Washington, U.S. National Park Service, 1958.

de Charleville, Raucourt
Traité sur l'art de faire de bons mortiers et d'en bien diriger l'emploi ou méthode générale pratique pour fabriquer en tous pays la chaux, les cimens et les mortiers les meilleurs et les plus économiques. Mahler, Paris, 1828.

de Ramecourt, Fourcroy
L'Art du chaufournier, n.p., Paris, 1766.

Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers, par une société de gens de lettres. Mis en ordre & publié par m. Diderot . . . & quant à la partie mathématique, par m. d'Alembert . . . Briasson, Paris, 1751-65. 17 vols. **Supplément à l'Encyclopédie . . . Mis en ordre et publié par m . . .** M. M. Rey, Amsterdam, 1776-77. 4 vols.

Francis, Dilys
1965
"The Mines and Quarries of Cape Breton Island During the French Period, 1713-60." Manuscript on file, National Historic Parks and Sites, Louisbourg.

Fry, Bruce, and Charles S. Lindsay
1969
"Excavation of the Dauphin Demi-bastion, 1966-67." Manuscript on file, National Historic Parks and Sites, Louisbourg.

Gay, Charles Merrick
Materials and Methods of Architectural Construction, by Harry Parker, Charles Merrick Gay and John W. MacGuire. John Wiley and Sons, New York, 1961.

Kalm, Per
Travels into North America; containing its natural history, and a circumstantial account of its plantations and agriculture in general, with the civil, ecclesiastical and commercial state of the country, the manners of the inhabitants, and several curious and important remarks on various subjects. Transl. by John Reinhold Forster. Printed for the editor, London, 1770-71. 3 vols.

Monroy, J. F.
Traité d'architecture pratique, . . . Hôtel de Bouthillier, Paris, 1789.

Louisbourg Guardhouses

by Charles S. Lindsay

Canadian Historic Sites
No. 12

49 **Abstract**
49 **Preface**
51 **Part I: Guardhouses: Their Construction and Use**
51 The Buildings
57 The Interiors
61 The Guard
63 Conclusions
64 **Part II: Gazetteer of Louisbourg Guardhouses**
64 **Barracks Guardrooms**
64 King's Bastion Barracks Guardrooms
64 *Officer's Guardroom*
65 *Soldiers' Guardroom*
67 Royal Battery Barracks Guardrooms
67 *Officer's Guardroom*
68 *Soldiers' Guardroom*
68 **Barracks Guardhouses**
68 Early Barracks Guardhouse
70 *Prison*
70 *Guardhouse*
71 **Battery Island Barracks Guardhouse**
75 Ile du Quay Guardhouse
75 Queen's Bastion Guardhouse
75 **Gateway Guardhouses**
75 Dauphin Gate Guardhouses
76 *Officer's Guardhouse*
77 *Soldiers' Guardhouse*
80 Queen's Gate Guardhouses
81 *Officer's Guardhouse*
81 *Soldiers' Guardhouse*
83 Maurepas Gate Guardhouses
83 *Officer's Guardhouse*
84 *Soldiers' Guardhouse*
86 Dauphin Demi-bastion Guardhouses
86 *Barracks / Guardhouse*
90 *Officer's Guardhouse*
90 **Town Guardhouses**
90 Place d'Armes Guardhouse
91 Pièce de la Grave Guardhouse
96 English Guardhouse
97 **Endnotes**
99 **Bibliography**

Illustrations

50 *1 Distribution map of Louisbourg guardhouses.*
52 *2 French guardhouse.*
52 *3 French guardhouse.*
53 *4 French guardhouse.*
54 *5 Guardhouse at Mont Dauphin, France.*
55 *6 Guardhouse at Fort des Trois Têtes, France.*
56 *7 Window in the reconstructed Place d'Armes guardhouse, Louisbourg.*
57 *8 Shutters on the reconstructed Place d'Armes guardhouse, Louisbourg.*
58 *9 Fireplace in the officer's quarters of the reconstructed Place d'Armes guardhouse, Louisbourg.*
59 *10 Soldiers'* lit de camp *in the reconstructed Place d'Armes guardhouse, Louisbourg.*
60 *11 Guardhouse furnishings and gun racks.*
65 *12 Excavated remains of the King's Bastion barracks guardrooms.*

66 *13 Historical plans of the King's Bastion barracks guardrooms.*
68 *14 Historical plan of the Royal Battery barracks guardrooms.*
68 *15 Historical plan of the early barracks guardhouse.*
69 *16 Hypothetical ground plans of the early barracks guardhouse/prison.*
71 *17 Painting of Battery Island.*
72 *18 Hypothetical ground plan of the Battery Island barracks guardhouse.*
77 *19 Historical plan and elevation of the Dauphin Gate and its guardhouses.*
78 *20 Excavated remains of the Dauphin Gate and its guardhouses.*
79 *21 Excavated remains of the latrine of the Dauphin Gate guardhouses.*
81 *22 Historical plan of the Queen's Gate guardhouses.*
82 *23 Re-assembled doorway of the armoury of the Queen's Gate guardhouses.*
83 *24 Historical plan of the Maurepas Gate guardhouses.*
84 *25 View of the Maurepas Gate guardhouses.*
85 *26 Excavated remains of the Dauphin Demi-bastion barracks/guardhouse.*
87 *27 Excavated remains of the Dauphin Demi-bastion barracks/guardhouse.*
88 *28 Doorway/window of the Dauphin Demi-bastion barracks/guardhouse.*
89 *29 Fireplace in the Dauphin Demi-bastion barracks/guardhouse.*
91 *30 Historical plan and view of the Place d'Armes guardhouse.*
92 *31 Excavated remains of the Place d'Armes guardhouse.*
93 *32 Excavated remains of the Pièce de la Grave guardhouse.*
94 *33 Excavated remains of the Pièce de la Grave guardhouse.*
95 *34 Quoin stones of the Pièce de la Grave guardhouse.*
95 *35 Stove base in the soldiers' quarters of the Pièce de la Grave guardhouse.*

Abstract
Louisbourg guardhouses are studied from two aspects, architectural and functional, by bringing together primary historical and archaeological evidence from Louisbourg, secondary historical evidence from France, and pictorial evidence of surviving French guardhouses. The results have shown that Louisbourg guardhouses were parallel in building techniques and materials with the simpler guardhouses used in lesser positions in France. In layout and function they were consistent with the principles applied to all French guardhouses. The evidence also shows that, consistent with much of the other construction work at Louisbourg, few concessions were made to the climatic differences between France and North America.

Submitted for publication 1971, by Charles S. Lindsay, National Historic Parks and Sites, Ottawa.

Preface
This study was undertaken specifically for the purpose of obtaining information pertaining to guardhouses in order to provide data for design and interpretation of those guardhouses scheduled for reconstruction as part of the Fortress of Louisbourg Restoration Project. The paper summarizes the available historical and archaeological information from the guardhouses known to have existed during the major occupation period at Louisbourg between 1713 and 1768.

Primary historical evidence is drawn mainly from *toisés* and repair records. The *toisés* are of various types including *devis* (specifications for proposed buildings), *toisés provisionnels* (preliminary accounts of work done) and *toisés définitifs* (final detailed breakdowns of costs, materials and labour). The most important repair lists come from the years 1749 and 1750 when the French were refurbishing the fortress after it had been in English hands for four years. Other documentary evidence is found in letters from various officials at Louisbourg to the Minister of Marine in France, and brief descriptions of the guardhouses and their furnishings drawn up by the engineer Franquet in 1751 and 1753. Numerous plans of the fortress provided many additional pieces of information.

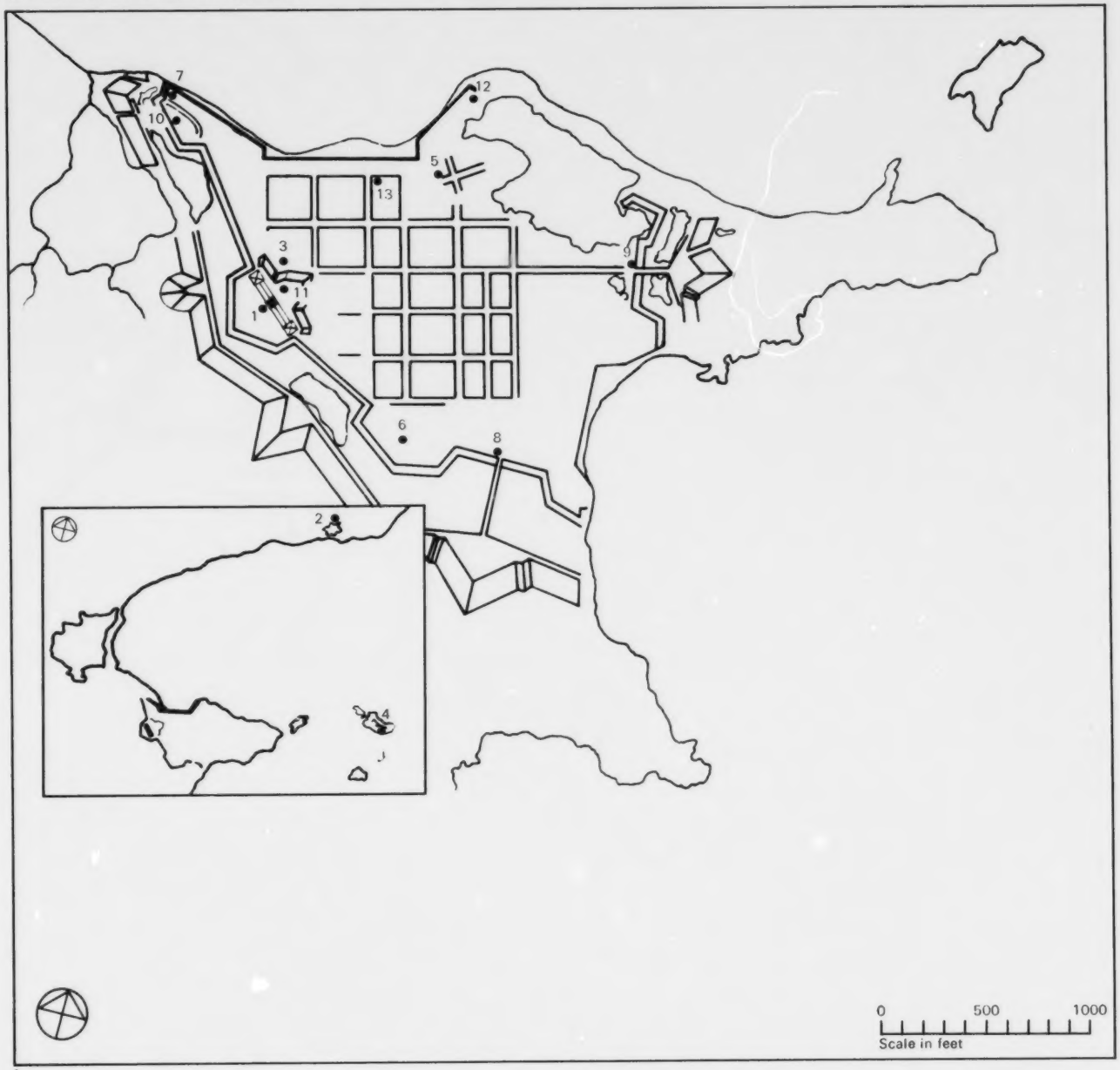
Archaeological evidence comes from the eight guardhouses that have been excavated wholly or in part, and the results of field observations where outlines of buildings are still visible on the surface. Unfortunately none of the excavated guardhouses survived much above floor level, but debris lying in and near the buildings provided many clues to the nature of their superstructures.

Secondary archival source material is very sparse, with the exception of some detailed drawings of guardhouses in a treatise belonging to the Bibliothèque du Génie. Field observation of surviving guardhouses in 18th-century fortresses in France, however, has been more productive, providing numerous details for comparison and contrast with Louisbourg guardhouses. Nevertheless, evidence from these buildings should be treated cautiously since they have been subject to 19th- and 20th-century alterations.

Two systems of measurement have been used in this paper. Where the evidence is from French documents or plans, the French system of *pieds* (1.066 ft.) and *pouces* (1.066 in.) has been retained. Where the evidence is from excavations or field observation the units of measurement used are feet and tenths of a foot.

Where French words are used, the original spelling as found in the documents has been retained. In those instances where significant differences in spelling occur, the modern version will be found in an endnote. Many terms used in documents relating to 18th-century Louisbourg have quite different meanings elsewhere and in other periods. Where such terms have been used in the text an explanation of their interpretation will be found in an endnote.

1 Distribution map of Louisbourg guardhouses. *1*, Citadel Barracks Guardrooms; *2*, Royal Battery Guardrooms; *3*, Early Barracks Guardhouse; *4*, Island Battery Guardhouse; *5*, Ile du Quay Guardhouse; *6*, Queen's Bastion Guardhouse; *7*, Dauphin Gate Guardhouses; *8*, Queen's Gate Guardhouses; *9*, Maurepas Gate Guardhouses; *10*, Dauphin Bastion Guardhouses; *11*, Place d'Armes Guardhouse; *12*, Pièce de la Grave Guardhouse; *13*, English Guardhouse.



1

Part I
Guardhouses: Their Construction and Use

The guardhouses that existed at Louisbourg between 1713 and 1768 can be divided into three functional types. The first includes six guardhouses and guardrooms directly associated with barracks. The second consists of four pairs of guardhouses situated at the town gateways. The third consists of three guardhouses, not directly associated with any specific building or fortification, that were used to house the guard responsible for general sentry duty throughout the town.

The Buildings

In almost every instance each guardhouse (or, as at the gateways, each pair of guardhouses) contained quarters for officers and soldiers, and often subsidiary rooms such as an armoury, a cell, latrines or a coal shed. Armouries were built at the Queen's and Maurepas gate as part of the officers' guardhouses, but apparently were soon converted to cells (Fig. 24). Cells were part of the original design of guardhouses at the Royal Battery and Battery Island which were isolated from the town. In the early barracks, near what later became Block 17, the guardhouse contained both a cell and a *cachot* (a windowless cell or dungeon).

All three gateway guardhouses had latrines, in all cases attached to or incorporated with the soldiers' quarters. A *toisé* describes a soldiers' and an officer's latrine at the Maurepas Gate but indicates no differences between them.[1]

Two of the guardhouses had wooden lean-tos along the back for storing coal. Some of the French guardhouses, as in Figure 3, had part of the porch along the front blocked off to create a *petit magasin*. The lean-tos seem to have been removed around 1753, since Franquet noted in that year that they were no longer in use, and they do not appear on any plans or views after that date.[2]

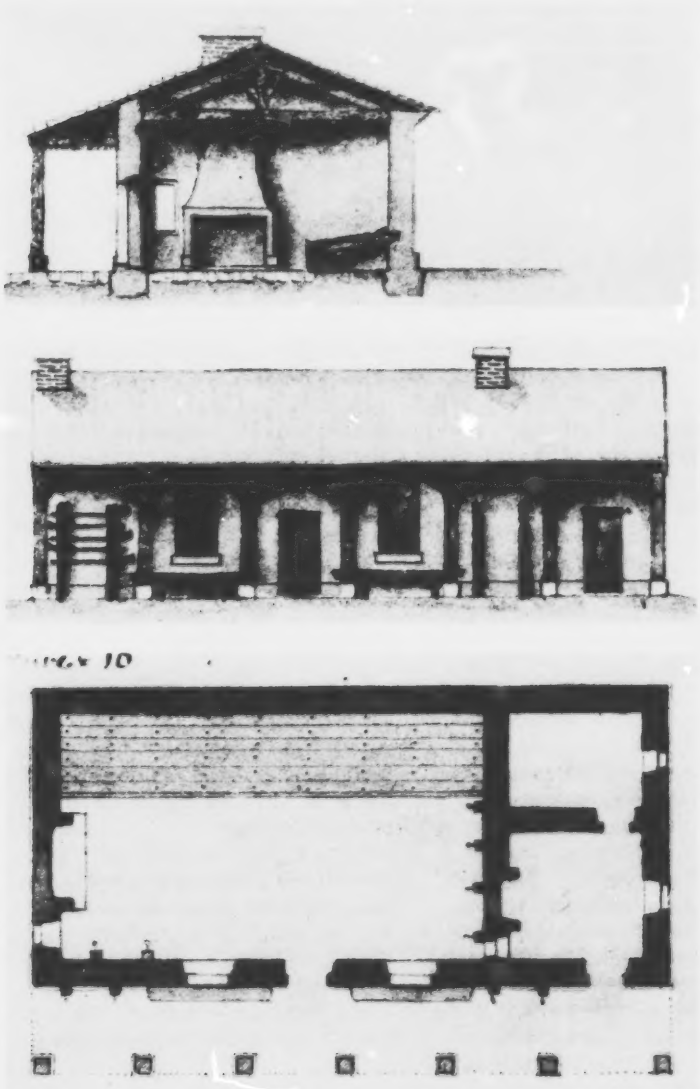
Peculiar to Louisbourg was the arrangement of rooms whereby, in all cases except one, the soldiers' quarters were on the left and the officers' on the right when viewed from the front of a building containing both rooms; or, when viewed from inside the fortifications, as in the case of the gateway guardhouses where separate buildings flanked the roadways inside the gates. There was no such standardization in French guardhouses, and no functional advantage can be discerned. Possibly it was merely a personal preference of Verrier, the engineer in charge of the king's buildings between 1724 and 1745, when all of the guardhouses whose room plans are known were being constructed. It may be significant that the ground plan of the one exception to this arrangement, the King's Bastion barracks guardrooms, was already laid out when Verrier arrived at Louisbourg.

The only guardhouse where quarters for an officer were not provided was at the island battery. In the Dauphin Demi-bastion an influx of troops in 1755 apparently caused the officer's quarters to be turned over to the soldiers and a separate building for the officer was erected in front of the main guardhouse.

Except for the guardhouse associated with the early wooden barracks near Block 17, all the Louisbourg guardhouses were masonry buildings. The walls, usually about 2 *pieds* thick, were set in lime mortar and most were covered with *crépissage à pierre apparente* (roughcasting with the stones showing through). In one case, the island battery, the walls were protected with a sheathing of one-*pouce*-thick Boston boards.[3] Evidence from all excavated guardhouses and from historical elevations shows that the corners of the buildings consisted of dressed sandstone quoins, usually finished with a rough-pointed face surrounded by a flat-tooled border, a finish commonly used on cut-stones throughout the fortress.

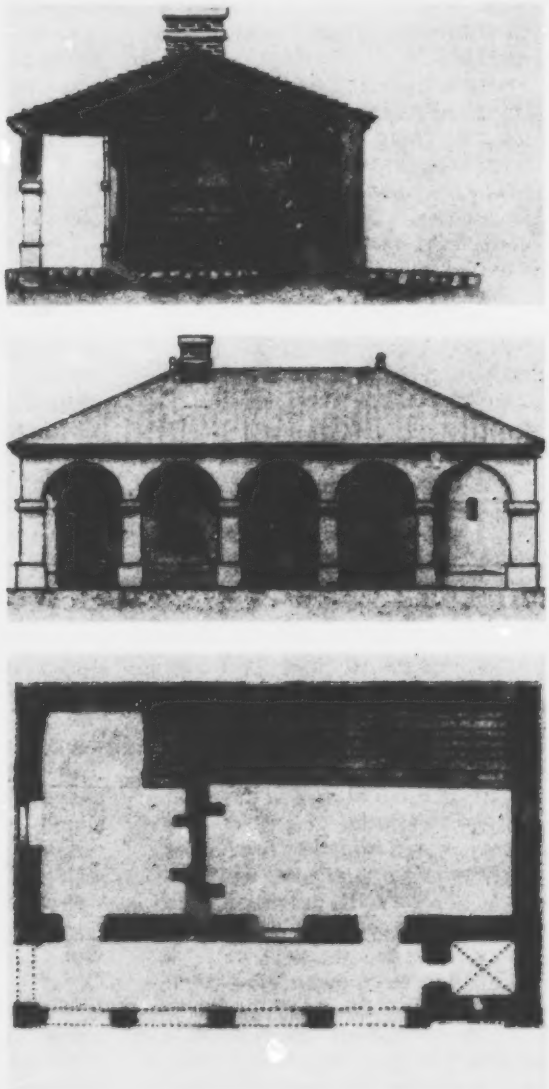
The roofs of most of the free-standing guardhouses were hipped and shingled. The two exceptions were at the Maurepas Gate where two layers of Boston boards were originally used and shingles added some years later, and at the Queen's Gate where slate was used, with shingles being added as repair patching. Of the three roofs for which we have any significant information, all had the same basic frame of trusses (principal rafters, king post and tie-beam), hip rafters, ridge, purlins and common rafters. In only one instance, the island battery, was furring (*accoyeau*)[4] mentioned, but since this was a common feature of Louisbourg roofs in general, it probably also ex-

2 French guardhouse, from a plan entitled "Profils et Elevations de divers desseins de Corps de Garde." *(Bibliothèque du Génie.)*



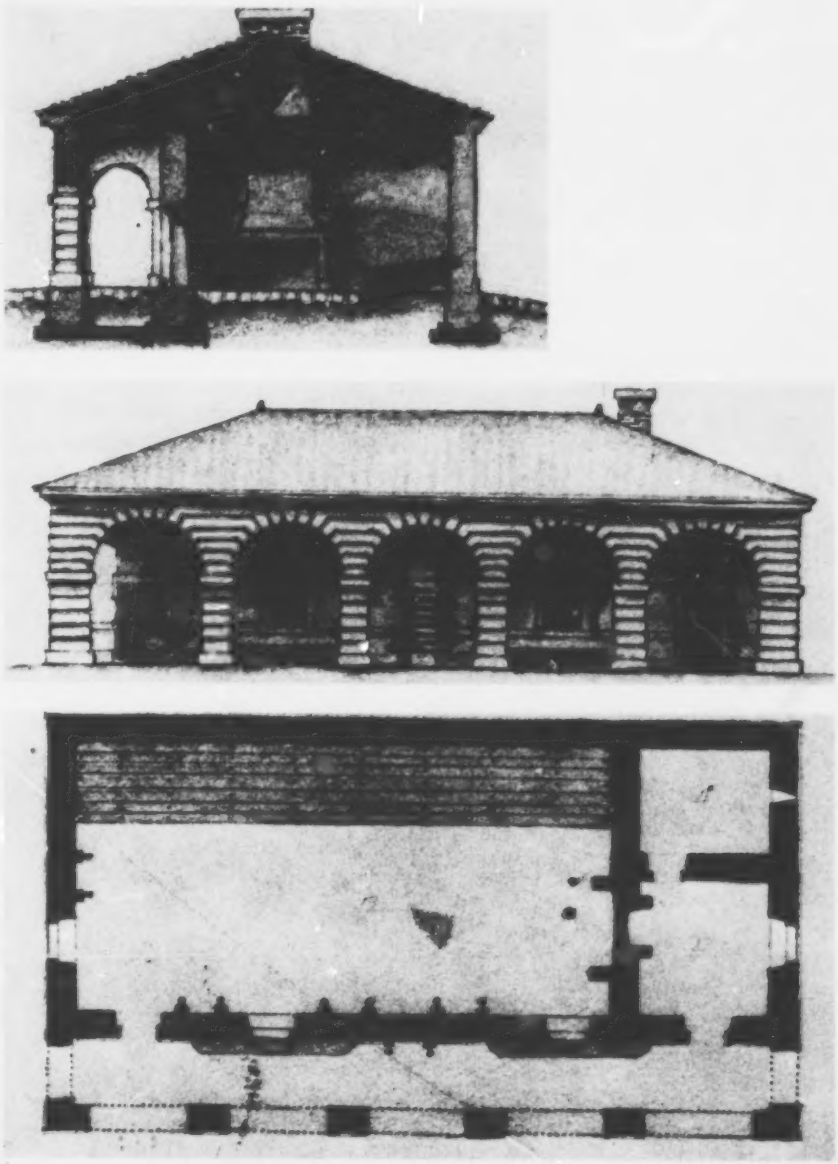
2

3 French guardhouse, from a plan entitled "Profils et Elevations de divers desseins de Corps de Garde." *(Bibliothèque du Génie.)*



3

4 French guardhouse, from a plan entitled "Profils et Elevations de divers desseins de Corps de Garde." *(Bibliothèque du Génie.)*



4

isted on the other guardhouses. In all documented cases the wood used for roof framing was pine.

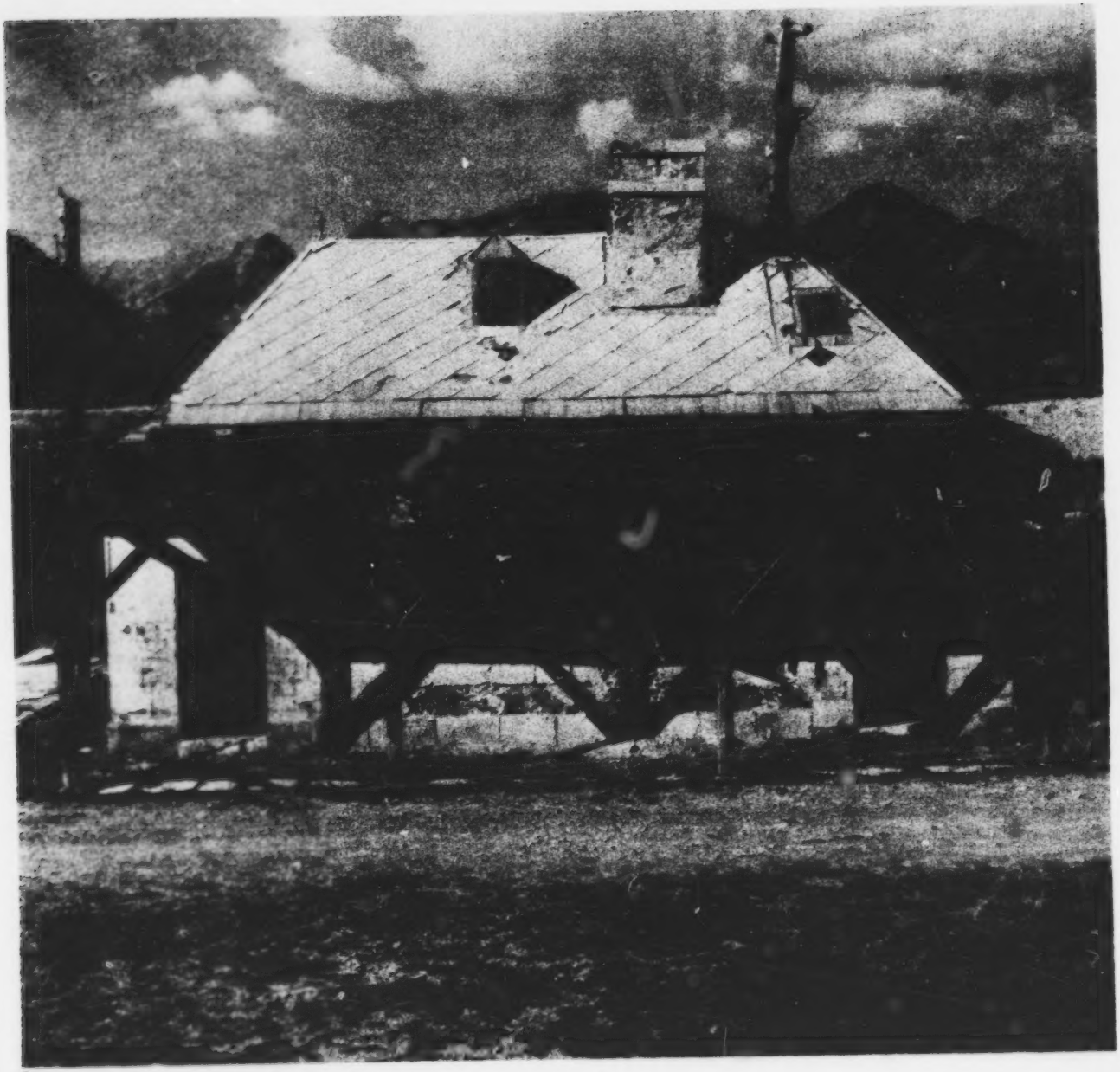
Each room in the guardhouses had its own outside door, except for some of the cells. In most cases the surround for this door was of dressed sandstone finished similarly to the quoin stones. The jambs commonly had a 6-*pouce* reveal and a 2-*pouce* check for an inward-opening door. In addition, in 1749 the doorways to the officer's room of the Dauphin Demi-bastion, the Place d'Armes, and the Pièce de la Grave guardhouses were furnished with storm doors one *pouce* thick. The one-*pouce* check for such a door was found during excavation on the jamb stones of the officer's doorway in the Dauphin Demi-bastion guardhouse (Fig. 28). Except for these doors, which were made of Boston boards, most others were 2 *pouces* thick and made of pine planks. The common method of door construction at Louisbourg consisted of vertical pine planks tenoned at top and bottom into hardwood horizontal rails.[5] The doors were held in position by a pair of strap hinges, usually 2 *pieds* long, pivoting on pintles set in the sandstone jambs. Most doors were secured with rim-locks (*serrures Bernades*).[6]

With the exception of sash windows in the Royal Battery guardrooms, all the windows were casements, usually with two leaves (Fig. 7). As with the doors, most of the surrounds were dressed sandstone with a one-*pouce* shutter check, a 6-*pouce* reveal, and a 2-*pouce* frame check. In the documents the window frame and the sash are rarely distinguished since the term *châssis* is normally used alone. This word can

5 Guardhouse at Mont Dauphin, France.

5

) Guardhouse at Fort des Trois Têtes, France.



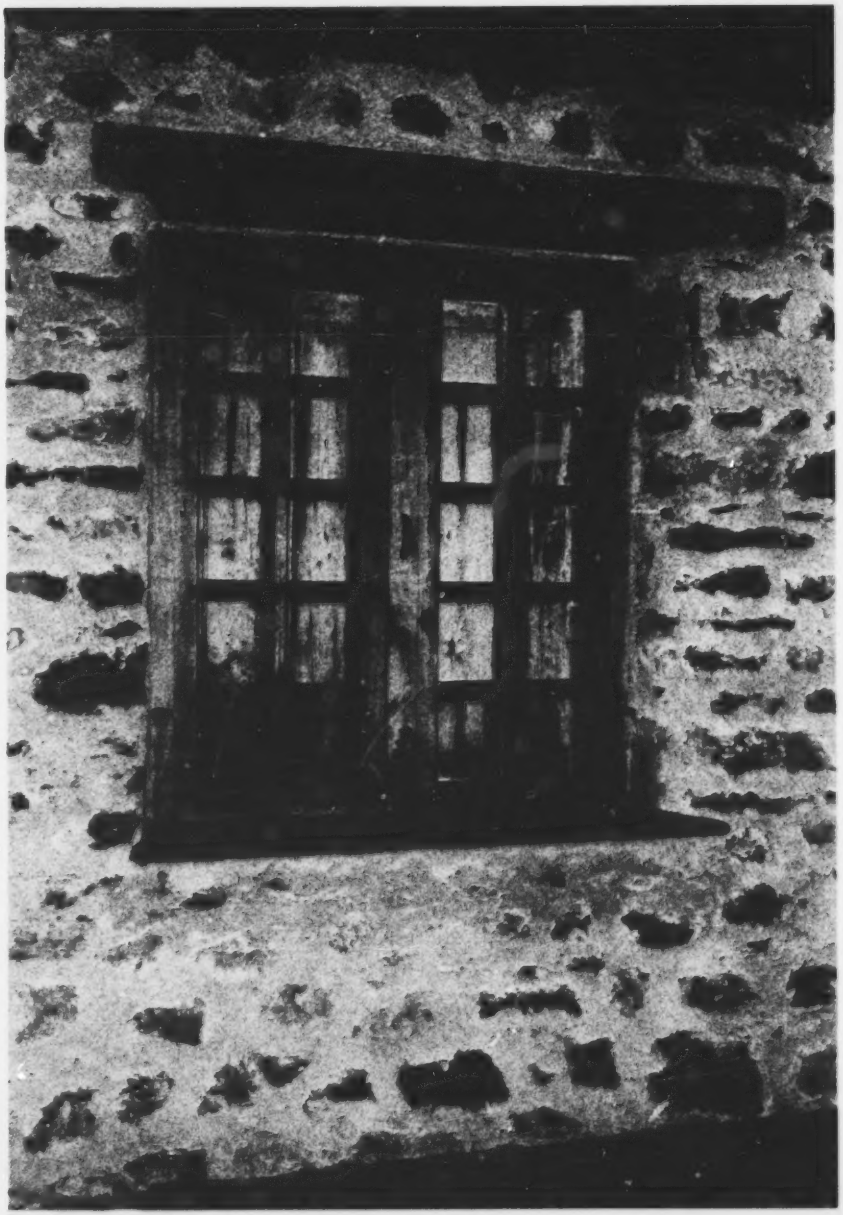
7 Window in the reconstructed Place d'Armes guardhouse, Louisbourg. This window pivots on short strap hinges rather than the more usual *fiche à vase* type.

mean either a frame or a sash. Occasionally the terms *châssis de croisée* (a sash), and *châssis dormant* (a frame), are used. Most *châssis* were approximately 4 *pieds* high by 3 *pieds* wide. Hardware lists include jamb anchors for holding the frame in position. These anchors were driven into the masonry surrounding the window opening and nailed to the frame through a flat terminal. Most sashes pivoted on loose-butt hinges (*fiches à vase*) morticed into frame and sash, two on each leaf. The windows were fastened with spring-bolts (*verrouils à ressorts*) which were vertical bolts at top and bottom of the inner edge of one leaf.

The shutters were all one *pouce* thick, often were constructed similar to the doors and were made of a variety of woods including fir, oak and pine. Hardware for shutters is nowhere mentioned in the documents, but presumably they were supported in the same manner as the doors with strap-hinges and pintles (Fig. 8).

Most guardhouses had wooden floors and ceilings. The floors consisted of pine joists, usually 6 *pouces* by 7 *pouces* and spaced from 3 *pieds* to 5 *pieds* apart, overlain by a single or double thickness of 2-*pouce* or one-*pouce* pine planks or boards. The ceilings were similar, though in some cases (e.g., at the Maurepas Gate), the joists were lighter, being 4 *pouce* by 5 *pouce* pine.

In two instances cobble floors were used: in the King's Bastion barracks soldiers' quarters and in the



7

8 Shutters on the reconstructed Place d'Armes guardhouse, Louisbourg.

8

Dauphin Demi-bastion guardhouse when it was originally built as a barracks.

All but one of the gateway guardhouses and the two town guardhouses had porches (*galleries*) along the front wall. The one exception was the officer's guardhouse at the Dauphin Gate, where a porch would have obstructed traffic through the gateway. Also, the first design of the guardrooms in the passageway of the King's Bastion barracks incorporated an arcaded walkway along the front wall that would have functioned as a porch.

Evidence from France indicates that these porches were a common feature of guardhouses (Figs. 5, 6). One document describes the purpose of porches as providing cover for the arms and a walkway for the guards on duty.[7] Some of the illustrations show arms racks along the porch and benches attached to the wall. The majority of the porches on French guardhouses (Figs. 2, 4) were constructed with masonry posts and arches, yet most of the Louisbourg porches and some of those surviving in France used wooden framing. At Louisbourg all the porches were 6 *pieds* wide with the exception of that at the Pièce de la Grave, which was 9 *pieds*. The posts were spaced at intervals of between 5 *pieds* and 6 *pieds*. The specific type of framing and bracing was shown only on the porch at the Dauphin Gate (Fig. 19). In those instances where documentary and archaeological evidence has survived, the posts were set into a sleeper unlike most of the French examples, which rested on low masonry plinths. Most of the porches on drawings of French guardhouses had a cobbled floor, as did the interiors. At Louisbourg the porch flooring at the Pièce de Grave was gravel, but at the Dauphin Gate it may have been a cobble continuation of the roadway, and there is some evidence to suggest that the Place d'Armes porch floor was also cobbled. All Louisbourg evidence points to a ceiling under each porch roof, and the surviving guardhouse at Briançon also has one. It is not clear what function such a ceiling served.

By 1753 the porches cease to be shown on historical plans, which could mean that they had been removed.

The Interiors

As might be expected, the interiors of the officers' quarters were noticeably more comfortable than those of the soldiers. The walls of most of the officers quarters were plastered, and most had a fireplace, usually set in the dividing wall (Fig. 9). Most of the fireplaces were replaced with brick stoves when the French returned to Louisbourg in 1749.[8]

9 Fireplace in the officer's quarters of the reconstructed Place d'Armes guardhouse, Louisbourg.

9

According to the *Ordonnance du Roy* of 25 June 1750, an officer's quarters should contain a leather armchair and a wooden table and nothing else.[9] At Louisbourg, however, this was generally ignored, and officer's quarters contained considerably more furniture. In most officer's quarters there was a *lit de camp*, or plank bed (Fig. 10). The frames of these beds consisted of short vertical posts at the foot with a plate to which were attached "rafters," sloping gently upward, either set into the wall at the head or into another plate anchored to the wall. On top of this framing, planks or boards were laid to form the bed. Most of those at Louisbourg were made of pine, although a few were of fir. They were between 6 *pieds* and 7 *pieds* long by 3 *pieds* to 4 *pieds* wide and were approximately 3 *pieds* to 4 *pieds* above the floor at the head. In 1750, a document states that the officers in barracks were not supplied with mattresses or blankets, but by 1755, a list of furnishings for officers' rooms in the barracks and guardhouses included mattresses, blankets, a box mattress and bolster.[10]

Most information on other furnishings comes from marginal notes made in a report on guardhouses drawn up by Franquet in 1753.[11] The list includes cupboards *(armoires* and *demi-armoires)*, tables, a table with drawers, armchairs, and a straw chair. In 1749 and 1750, most of the repair lists for officers' quarters included refurbishing the *armoires de consine* which were cabinets designed for keeping or displaying the orders of the day.[12] The repairs enumerated mention doors and shelves of the *armoires de consine* which may be interpreted as meaning that the orders were kept inside rather than displayed there. One document describes the *armoires* as made of pine, and at least one is mentioned as having a glass front.

By the *Ordonnance du Roy* of 25 June 1750, *standing orders and orders of the day will be posted in all the guardhouses in order that the officers, sergeants and corporals will be informed of what they have to do. If anyone defaces these orders he will be placed in prison for 15 days.*[13] One document of 1734 describes a corporal of the guard receiving a thief to be placed in the cell and being ordered to note in the *consines* for the benefit of the next guard on duty that the man was not to be let out.[14]

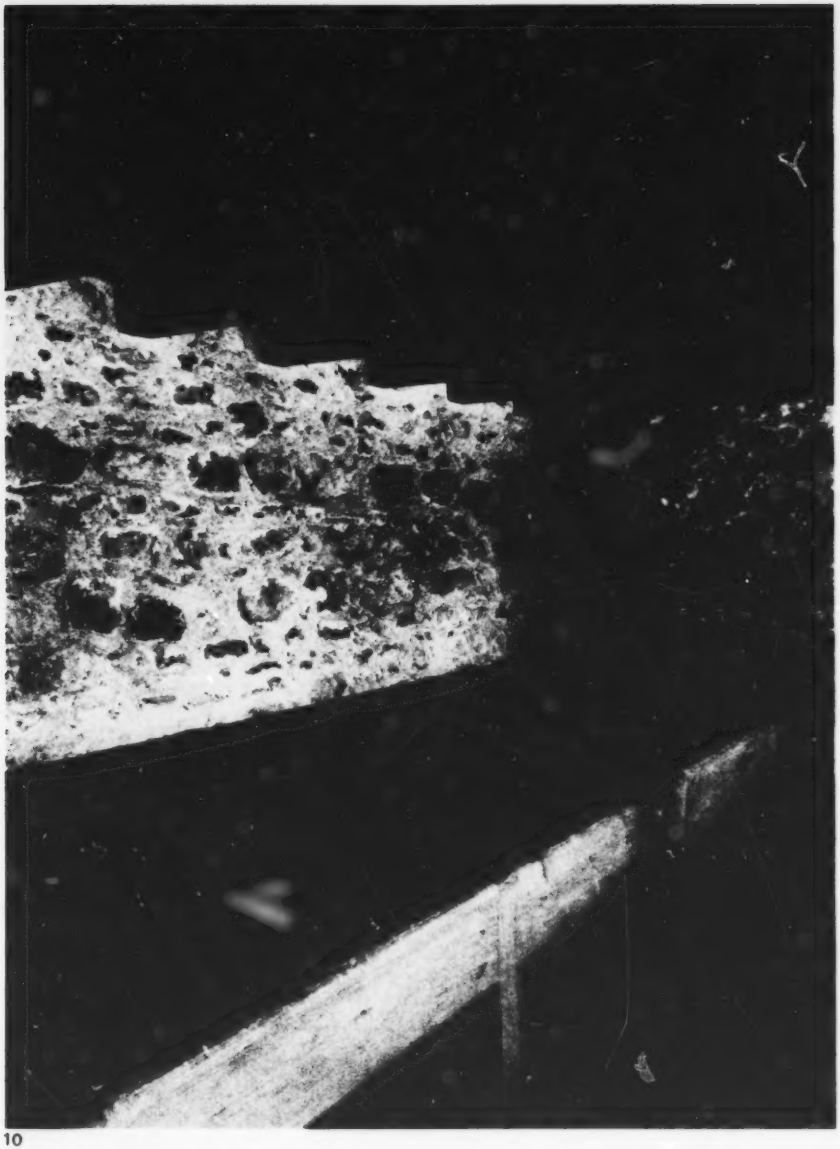
In 1755, Franquet wrote to France requesting 50 copies *en placards* of the *Ordonnance du Roy* of 1 July 1727 to be posted in all the guardhouses and barracks.[15] This *ordonnance* was concerned with military offences and punishments, and as printed in the second edition of the *Code militaire*, is 15 pages long.[16]

The soldiers' quarters were more sparsely furnished. The walls were not plastered and, except for the soldiers' quarters in the Royal Battery, none had fireplaces. Instead all had brick stoves except the King's Bastion barracks guardroom, which had an iron stove that was later replaced with a brick one.[17] These stoves were removed each spring and the site covered with temporary flooring. An account of fuel used in the King's Bastion barracks soldiers' guardroom shows that they used 30 cords of wood "in the eight months of winter between the month of October and the end of May."[18]

Sleeping accommodation consisted of a *lit de camp* similar to the ones in the officers' quarters but up to 28 *pieds* long and designed to hold a large number of men at one time. Bedding was similar to that found in the soldiers' rooms in the barracks. Soldiers were issued a straw tick and woollen blankets with embroidered *fleurs-de-lis*. In the barracks at least, and probably also in the guardhouses, the soldiers slept with their clothes on in winter.[19]

Apart from the bed the only other common furniture was a table with as many as six benches around

) Soldiers' *lit de camp* in the reconstructed Place d'Armes guardhouse, Louisbourg.



10

it. The rather plain construction of the furniture in contrast to that in the officers' quarters can be seen in Figure 11.

The only soldiers' quarters with a cupboard was in the Place d'Armes guardhouse where it was described as a fixed cupboard *(armoire à demeure)*.

Almost all the soldiers' quarters contained arms racks. The amount was given either by number (Franquet's 1753 list) or by running length (1750 repair estimates). The repair estimates sometimes mention pegs for the racks,[20] presumably similar to those shown in Figure 11. The illustration shows that the rack consisted of two uprights held to the wall by masonry anchors, with matching rows of holes in each post. Pegs were placed in these holes and the guns laid horizontally across them. Figure 4 shows these racks attached to the walls in the plan view of a guardhouse. In addition one is shown, with guns on it, in the elevation of the front of the guardhouse, attached to the outside of the wall.

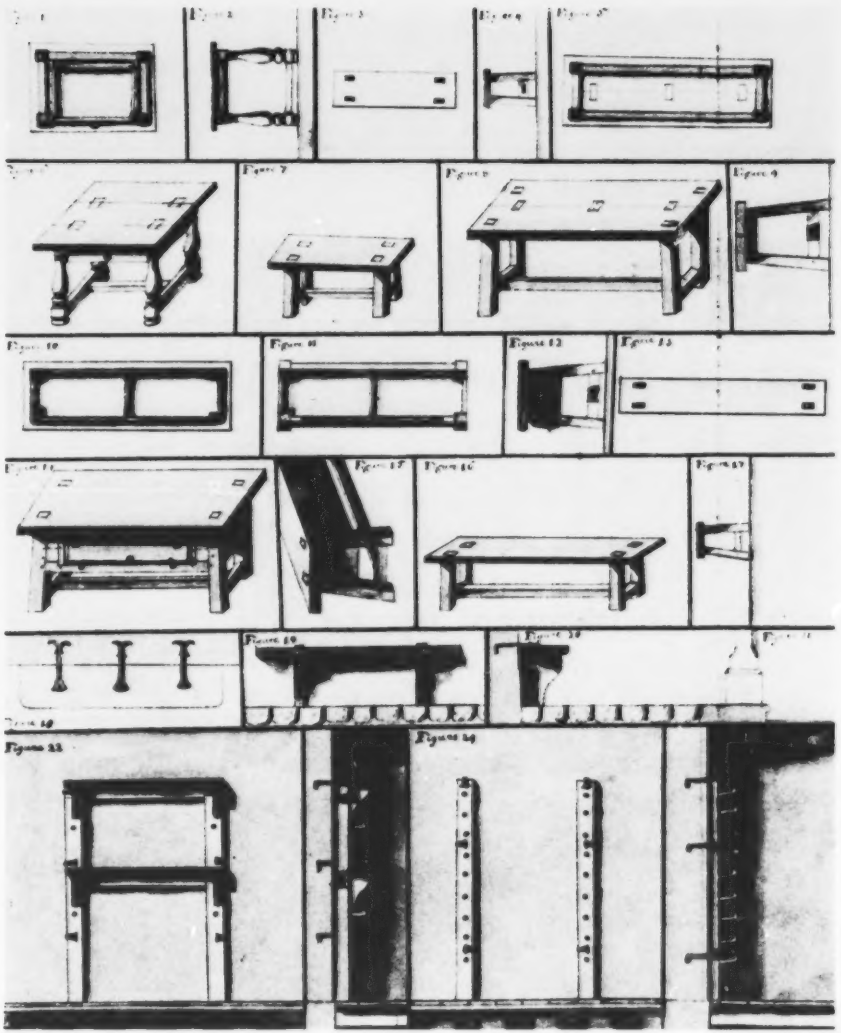
Arms placed on the rack outside present a problem, however. The *Code militaire* stated that each sentry should carry his gun already charged, and enough powder and shot for three rounds.[21] This degree of preparedness seems to be in conflict with placing the arms on a rack. Possibly, since the illustrated guardhouses were all situated at gateways, the racks may have been temporary

resting places for the arms of the sentries while they checked incoming and outgoing traffic.

Guardhouses at Louisbourg contained a number of tools and utensils, though the documents do not normally assign them specifically to officers' or soldiers' quarters. Tools included axes, picks, crowbars, shovels, cross-cut saws, sawhorses and barrows. The axes and saws were presumably for cutting firewood; the purpose of the other tools is not so clear.

Utensils present in the rooms can be divided into those for the convenience of the occupants and those connected with guard duties. In the first category are iron cooking pots, coal shovels and pokers, candles and copper candlesticks, copper snuffers with their trays and iron-framed lamps. In the second category are lanterns for the rampart patrols, blue capes and partisans for the sentries, half-hour glasses, and boxes for the *marons des rondes* (tokens for marking the progress of the rampart patrols).

While the documentary evidence does not make the contrast explicitly, it would appear that lighting for the officer's quarters was by candle (specifically stated in the documents), and for the soldiers' quarters by lamps. The lamps were iron-framed with horn windows and



11 Guardhouse furnishings and gun racks. Nos. 1, 2 and 6 are for an officer's quarters. Nos. 3, 4, 5, 7-17 are for soldiers' quarters. Nos. 18-20 illustrate a bench attached to the front wall under the porch. Nos. 22, 23 show fixed shelving. Nos. 24, 25 show a gun rack. From a drawing entitled "Desseins de differents tables et bancs et Ratteliers a posser les Armes . . . aux corps de gardes." *(Bibliotheque du Génie.)*

were normally either square or rectangular.[22] One request to France asked for lanterns made of tin with cylindrical bodies 16 *pouces* high and 9 *pouces* in diameter. They were described as *lanternes claires*, which may mean that they had glass windows as replacements.[23]

In 1742 and subsequent years, orders were sent to France for half-hour glasses for the guardhouses.[24] These glasses were to be filled with sand and mounted on strong frames. According to Diderot, half-hour glasses were commonly used on board navy ships to measure the passage of time for the watch. The half-hour glass was standard and consequently sailors thought of the day as divided into 48 major units. Thus a three-hour watch was expressed as *six horloges*.[25]

A list of material in the king's storehouse included at least one box for the *marons des rondes*.[26] These *marons* were wood or copper tokens, with the hour of the patrol marked on them, carried by the rampart patrols and deposited in the locked boxes which were located at various points and guardhouses along the patrol route as proof that the patrol had been carried out. The boxes were marked with the name of the guardhouse or point on the patrol route where they were situated.[27]

Last, but for the guard by no means least, at various times of day the guardhouse contained the beer ration, brought to the guardhouse in "watercasks with iron bands and two handles for passing a bar through."[28]

The above description of tools and utensils in the guardhouses comes exclusively from historical sources. Archaeological evidence adds the more transient material not considered worthy of mention in the documents. From a rubbish dump immediately outside the north wall of the Pièce de la Grave guardhouse a range of artifacts was recovered that indicates the type of replaceable goods present in the guardhouse. These included wine bottles, clay pipe stems and bowls, coarse earthenware dishes and bowls including some English slipware cups, a few pieces of finer wares such as a faience coffee pot, and a carved bone handle. Specific evidence of the military nature of the occupation was provided by the presence of gunflints and musket balls as well as part of a leg shackle. In addition the dump, which consisted mostly of cinders and charcoal, contained two small iron pintles and a cotter pin, no doubt all that remained in the bottom of the stove after the burning of an old door or cupboard for warmth at a time when firewood was in short supply, as it usually was at Louisbourg.

The Guard

Since Louisbourg was a responsibility of the Ministry of the Marine it was regulated by marine ordinances. Unfortunately we do not possess a complete list of these ordinances which were concerned with, among other things, the posting of guards. We do know, however, that at Louisbourg in those areas not covered by marine ordinances the ordinances of the *Code militaire* were to apply. We have copies of the *Code militaire* dating to 1728, and other *Ordonnances* relating to guards dating to 1750.[29] Consequently, the following description of the guard is no more than an outline based primarily on the *Code militaire*. More detailed description will have to await the compilation of marine ordinances since they may supplant the *Code militaire* in specific instances.

The security of a fortified town was the responsibility of three types of guard: sentries, rampart patrols and town patrols. Of these only the sentries were posted around the clock, the patrols being confined to night duty between retreat and reveille.

The rampart patrols were performed only by officers and sergeants. Normally the officer, a lieutenant or captain, would be chosen from among those not assigned to other duties, except when manpower shortages necessitated the use of the officer actually on guard duty that night. The sergeant performing these patrols, however, was normally taken from the guard on duty, except where he was the ranking member of a guard post.

The town patrol, according to the *Code de la marine*, was a detachment of six men from the guard of the arsenal.[30] Since there was no major arsenal at Louisbourg, these patrols were probably drawn from whichever guardhouse was the "town guard" at the time—either the Pièce de la Grave or Place d'Armes guardhouse. The responsibilities of the town patrols included "the quays, beaches, storehouses, streets and inside the arsenal, to stop all those

whom they found after the retreat, and to take them, without mistreatment, to the main guardhouse.''[31]

A document from the year 1741 contains a list of guards and sentry posts which were to be established the following year.[32] The list includes two guardhouses, that were not in fact built until 1744, at the Maurepas Gate and the Pièce de la Grave (the latter was described as *Corps de garde de la place;* the temptation to link this with the Place d'Armes guardhouse must be resisted since the list includes a guard for the *Bastion du Roi* which must have occupied that guardhouse, the one in the barracks passageway already having been converted to a prison). The reason for the inaccurate prediction of guard posts was quite simply that Governor DuQuesnel, who drew up the list, was overly optimistic about the time needed to build these guardhouses. Nonetheless we are probably safe in assuming that the disposition of sentries given in this list is what eventually occurred when all the guardhouses were completed in 1744.

The relevant sections of the list are as follows:

King's Bastion in front of the arms	
Sentries	1
Sergeants	1
Corporals	2
Drummers	1

At the governor's door	
Sentries	1

At the flanked angle	
Sentries	1

At the door of the prison	
Sentries	1

for this post 30 men for twenty-four hours which is 90 men for three days.

Queen's Gate in front of the arms	
Sentries	1
Sergeants	1
Corporals	2
Drummers	1

At the gate of the covered way	
Sentries	1

On the platform of the Princess Bastion	
Sentries	1

At the flanked angle of the Queen's Bastion	
Sentries	1

for this post 30 men for twenty-four hours which is 90 men for three days.

Dauphin Gate in front of the arms	
Sentries	1
Sergeants	1
Corporals	2
Drummers	1

At the gate of the covered way	
Sentries	1

At the powder magazine in the Dauphin Demi-bastion	
Sentries	1

During the night at the flanked angle of the said bastion	
Sentries	1

for this post 24 men for twenty-four hours which is 72 men for three days.

Maurepas Gate in front of the arms	
Sentries	1
Sergeants	1
Corporals	2
Drummers	1

At the gate of the covered way	
Sentries	1

At the flanked angle of the Maurepas Bastion	
Sentries	1

At the flanked angle of the Brouillan Bastion	
Sentries	1

for this post 24 men for twenty-four hours which is 72 men for three days.

Corps de garde de la place [Town Guard]	
Sentries	1

In front of the arms	
Sentries	1
Sergeants	1
Corporals	2
Drummers	1

At the door of the king's storehouse	
Sentries	1

At the door of the treasury	
Sentries	1

At the door of the hospital during the day	
Sentries	1

At the battery of the port [probably the Pièce de la Grave Battery]	
Sentries	1

for this post 33 men for twenty-four hours which is 99 men for three days.

The post "in front of the arms" *(devant les armes)*, since it had a sentry, a sergeant, two corporals and a drummer, must mean the guardhouse itself, and includes those members of the guard who were on duty, or at least on call, throughout the 24 hours. At the gateway guardposts, the sentry at the gate of the covered way was posted only during the day and was withdrawn when the gate was closed for the night.[33]

The list shows that each guard had primary and secondary duties. The primary duties were those for which the guard was mounted: guarding gateways, public building and barracks. The secondary duties, although incidental to the specific location of the post, were not minor in terms of their importance. Every one of the guard posts in the list, including the town guard, was responsible for at least some part of the perimeter fortifications. When one considers the size of the fortified town of Louisbourg with its defensive perimeters of nearly two miles, one can appreciate the desperate appeals made to France for more troops when the guard disposition shows a total of just seven sentries posted at any time for guarding the fortifications.

Although the list does not mention any officers, this does not mean that all the guards were commanded by sergeants. The list was drawn up to illustrate the shortage of men at Louisbourg and for this purpose the officers' duties were irrelevant. Another list of 1755 does include officers, showing that lieutenants commanded all posts except the town guard and the Dauphin Demi-bastion which were commanded by captains (by this time the guardhouses at the Dauphin Gate had been demolished).[34] This later list also shows that the number of men at each guard post had been reduced by between one-quarter and one-third.

Conclusions

Since so little is known of guardhouses elsewhere in French North America, the only significant comparison for the Louisbourg guardhouses is with those in France. When comparing them one is struck by both contrast and similarity.

To understand the contrast, the Louisbourg guardhouses must be seen within the context of the total scheme of fortifications around the town. Massive though its defences were in a North American context, Louisbourg was, in European terms, a poorly defended town. Fortifications, especially in France, at this time consisted of several major concentric lines of defences with numerous outworks and redoubts. Louisbourg, on the other hand, had but a single major line of fortification with virtually no outworks. Inevitably the elaborate nature of French fortifications demanded equally elaborate supporting structures and buildings. Thus, town gateways for example, were often massive structures, ornately decorated and built entirely with dressed stone, incorporating, within the massif, flanking guardrooms built in a similar manner. At Louisbourg, at the Dauphin Gate, the major entrance to the town, the guardhouses were relatively simple structures similar to those normally found in *demi-lunes* and other lesser positions in French fortification systems. The Louisbourg guardhouses, therefore, can be seen as homogeneous with other parts of the fortifications of the town.

The similarity between the simpler French guardhouses and those at Louisbourg is strikingly apparent both in over-all design and in details of construction. Surviving examples from Mont Dauphin, Fort des Trois Têtes and Briançon, with only minor modifications, could be transported easily to a Louisbourg context. Considering the relative harshness of the Louisbourg climate, even compared with that of the French Alps, this similarity indicates a general lack of awareness of the disastrous effects of extreme cold, plentiful snow and constant dampness on French building techniques. In fairness to the engineer Verrier, however, it should be noted that both adequate building materials and skilled construction workers were in very short supply at Louisbourg. Nonetheless, leaking roofs, drafty windows and doors, and rotting floors were at least partly the result of deficient design. Some belated at-

tempts were made in 1749 by the engineer Boucher, to offset these shortcomings by adding storm doors to the officers' entrances and by replacing their fireplaces with brick stoves which radiated heat over a wider area.[35]

In summary, the guardhouses can be seen as consistent with the design and construction techniques of the other fortifications and military buildings at Louisbourg, which is to say that they are comparable with simpler guardhouses in France, and, unfortunately for their users, also comparable with French construction techniques inappropriate to a Cape Breton climate.

Part II
A Gazetteer of Louisbourg Guardhouses

Barracks Guardrooms

Barracks guardrooms were situated in the central passageways of the barracks buildings in the King's Bastion and the Royal Battery.

King's Bastion Barracks Guardrooms

The officer's and soldiers' guardrooms occupied the full width of the barracks building on the north side of the central passageway, with the officer's room at the west end and the soldiers' quarters occupying the remainder (Fig. 13).

When first built in 1724, the wooden south or front wall of the room was separated from the passageway by an arcaded masonry wall supported on five pillars (Fig. 13, *a*). The walkway thus created between the guardrooms and the passageway was about 5 *pieds* wide and had a window in each end wall.

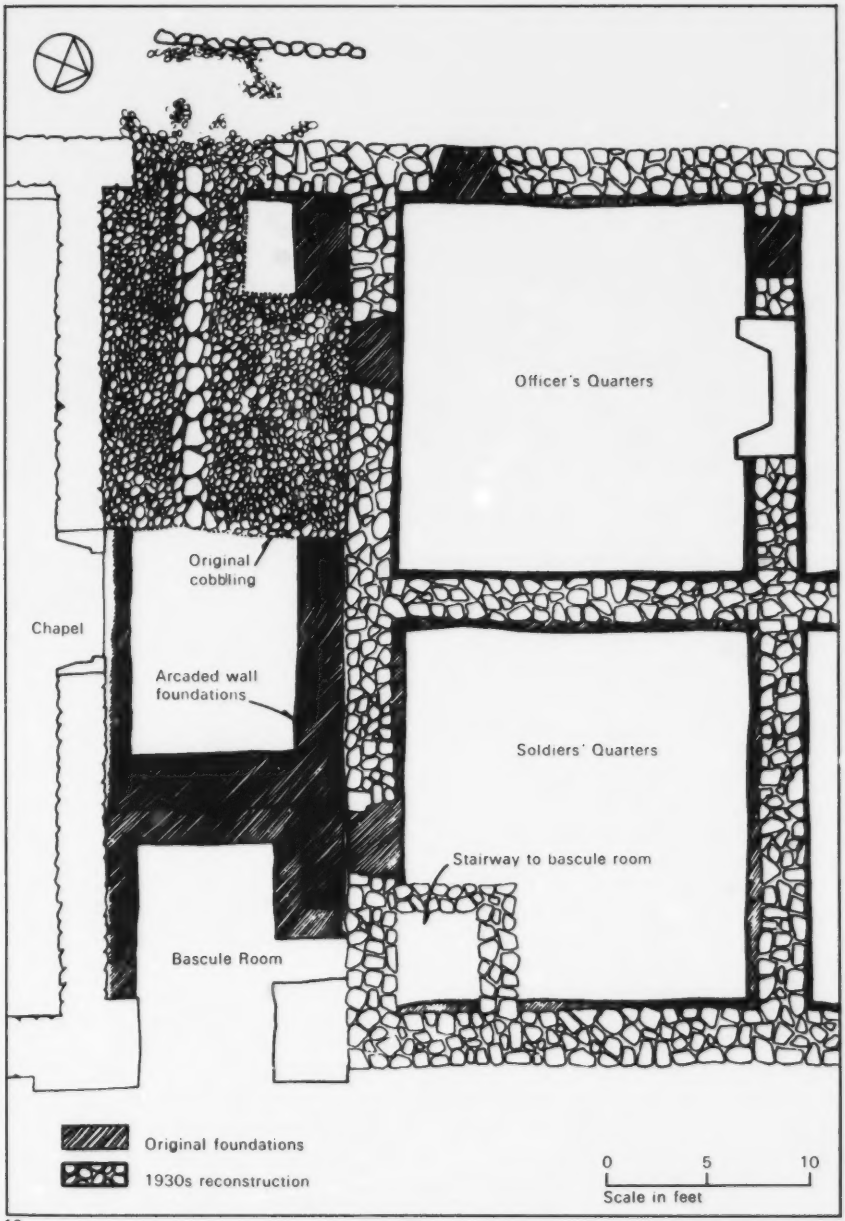
By 1725 plans had changed, the arcaded wall was demolished and the wooden front wall removed. As replacement, a 2-*pied*-thick masonry wall was built immediately behind the foundations of the arcaded wall.[1] This change created an asymmetrical central passageway 2 *pieds* wider on the guardhouse side. Excavation revealed that the foundations of both the new wall and the arcaded wall abutted each other, with the paving of the passageway extending over the remains of the arcaded wall foundations (Fig. 12). The arcaded walkway was now contained within the guardrooms, and its west window was blocked as part of the construction of a stairway to the upper floor. A partition with a door to the officer's room was built from the staircase to the dividing wall between the two rooms to seal off the staircase from the officer's quarters. At the same time the wooden dividing wall was replaced by a masonry wall further to the east, creating a ratio between the rooms of 2:1 (Fig. 13, *b*). By 1731, this wall had been removed and the full width of the building was occupied by the soldiers, while the officer had moved to a room upstairs.[2] At this date the partition around the stairway was altered to fully enclose the staircase.

The guardrooms had ceased to function as such by 1740 when a new guardhouse was built in the Place d'Armes across the bridge from the barracks. The interior dividing wall was re-established and the guardrooms were then converted into a prison cell and a room intended for cannoneers but actually occupied by soldiers.[3]

Officer's Guardroom

As shown on the earliest plan the dimensions of the officer's quarters were 13 *pieds* by 7 *pieds*. However, since this plan shows the wooden dividing wall between the officer's and soldiers' quarters intruding into the officer's fireplace, these dimensions should be regarded with caution. Following the alterations, which included removing and replacing the south and east walls and creating a vestibule for the winding stairway, the resulting room was 10 *pieds* by 13 *pieds*. With the modified arrange-

12 Excavated remains of the King's Bastion barracks guardrooms.



12

ment, access to the officer's room was gained via the vestibule and a door at the east end of the 7-*pied*-high plank partition wall. The other walls of the room and the chimney-breast were masonry covered with plaster. Both floor and ceiling were made of 2-*pouce*-thick pine planks. The door through the partition was made of one-*pouce*-thick boards and was 6 *pieds* high by 3 *pieds* wide. The window in the west wall was protected by wooden shutters one *pouce* thick and was 4 *pieds* 2 *pouces* high by 3 *pieds* wide.[4]

In the north wall there was a fireplace. This, and others like it in the barracks, were described as having hearths 6 *pieds* long, 3 *pieds* wide, and 6 *pouces* thick.[5] As excavated, all that remained of the original fireplace (in contrast to the 1930s reconstruction) was a mound of mortar, brick and rubble that had served as the support for the hearth (Fig. 12).[6]

A *lit de camp* 6 *pieds*, 6 *pouces* long by 3 *pieds* wide was installed along the partition between the room and the vestibule. No record of other furnishings survives but a document estimated that 250 candles and 10 cords of wood would be needed for light and heat for a year.[7]

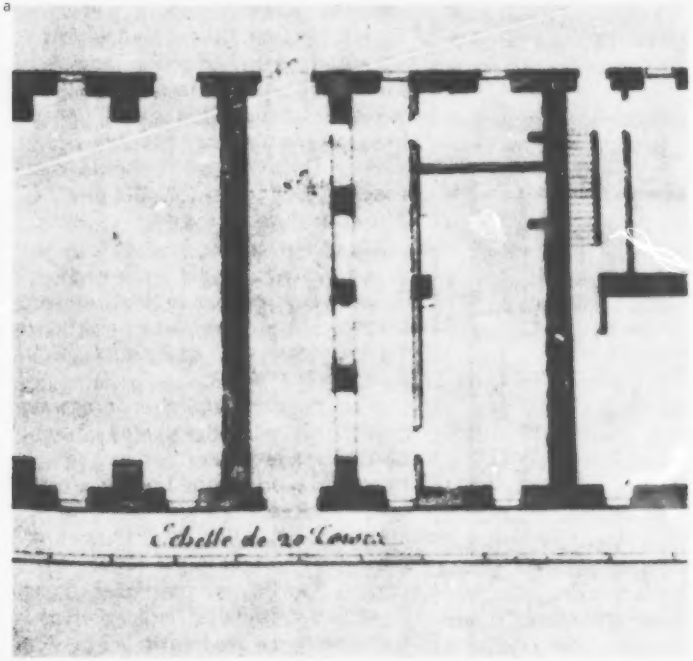
Soldiers' Guardroom

The original width of this room was 13 *pieds*, the same as the officer's, but since there is some doubt as to the reliability of the location of the dividing wall on the earliest plan, the length of the room is uncertain.

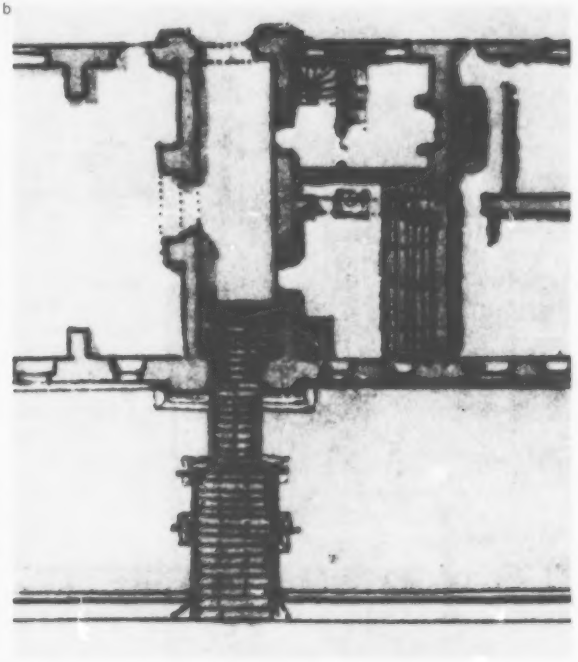
In its initial form the room had a window in the east wall and a door

13 Historical plans of the King's Bastion barracks guardrooms. *a*, 1724, showing the dividing wall between the rooms in the unlikely position of intruding into the officer's fireplace. From a plan entitled "Plan du rez de chaussée du corps de Caserne et du Bastion du Roy 1724." *(Archives du Génie)*; *b*, ca. 1725, after the modifications which removed the arcaded wall and substituted a masonry front wall for the original wooden one. The dividing wall is now in a more practical position. From a plan entitled "Bastion du Roy faisant partie de l'enceinte de La Ville de Louisbourg." *(Bibliothèque Nationale.)*

a



b



13

near the east end of the front wall. When the front and dividing walls were removed, the room became 23 *pieds* long by 16 *pieds* wide and the door was moved to the centre of the front wall.

Excavation revealed what seemed to be the foundations of the dividing wall in the middle of the width of the barracks, creating an officer's and soldiers' room of equal size (Fig. 12). However, documents and historical plans both show that in fact, above ground, this wall consisted merely of two short pillars, one against the north wall and one against the south, supporting an arch carrying the dividing wall of the rooms on the upper storey. The actual dividing wall of the guardrooms after the major alterations was approximately 4 *pieds* to the west, was 8 *pouces* thick and was called a *petit mur de refand*. The *toisé* for this wall mentions a foundation only one *pied* deep.[8] Such slight foundations can probably be attributed to the fact that this wall was a modification made after the guardhouse was built, and moreover it was not a load-bearing wall. No trace of this wall was found during excavation.[9]

The new doorway had a cut-stone surround and the door itself was 6 *pieds* 3 *pouces* high by 3 *pieds* wide, made of 2-*pouce*-thick planks.[10] The extension of the guardroom incorporated the old east window of the walkway and there were now two windows to light the room. Both the windows had birch sills, and fir frames 4 *pieds* high and 3 *pieds* wide.[11] Views of the barracks drawn during the French occupation show that the window surrounds were of brick.[12]

The ceiling of the room was made of 2-*pouce*-thick pine planks. The floor consisted of cobblestone paving, a flooring material commonly used in guardhouses in France.[13] In the southeast corner of the room

a double-leaf trapdoor led to steps going down to the *bascule* room, from which the drawbridge was operated.

Along the full length of the north wall there was a *lit de camp* 6 *pieds* 6 *pouces* wide made of pine planks 2 *pouces* thick.[14] One of the plans shows what appears to be a stove centrally placed beneath the arch for the upper storey. Repair lists note that the first stove was made of iron, and that its flue and door were repaired in 1728.[15] The next year, the stove having been *"entièrement ruiné,"* it was replaced by a brick stove. The estimates for this repair included bricks, an iron grille, the frame for the door and other fittings. This stove was taken down each spring and rebuilt in the fall. Annual records from 1732 to 1735 mention repeated building of the brick stove and repairing of its flue.[16]

When the dividing wall between the guardrooms was removed and the officer moved upstairs sometime between 1729 and 1731, a number of changes were made. The officer's *lit de camp* was removed, and the partition around the staircase was extended to join the south wall east of the doorway, thus creating a private entrance to the officer's room upstairs. The paving in the soldiers' room was extended to cover the former officer's floor.[17]

Royal Battery Barracks Guardrooms

The Royal Battery guardrooms were situated on either side of the central passageway of the barracks, the officer's on the east side and soldiers' on the west (Fig. 14). Little is known of the history of these rooms beyond the fact that they were built, along with the rest of the barracks, between 1725 and 1727, and appear to have remained substantially unaltered throughout their occupation, which ended in 1760 when the English razed the Royal Battery and its buildings.

Neither room has been excavated and nothing is visible on the surface to indicate the exact position of the passageway or rooms. The historical evidence is confined to a few plans, a list of estimates for the proposed barracks buildings and occasional accounts of repairs carried out.

Because of the flattened-V shape of the barracks building with the apex at the passageway, both guardrooms were trapezoidal. Both had doors and windows opening on the terreplein of the battery at the opposite end of the passageway from the bridge. There was, therefore, no direct access from either guardroom onto the passageway.

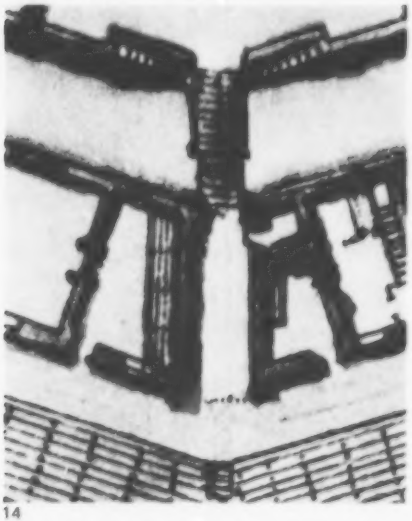
Officer's Guardroom

The officer's room shared the east side of the passageway with the prison. The room was 11 *pieds* long and widened from 8 *pieds* at the partition to 12 *pieds* at the terreplein wall. There was a doorway in the south wall with a small window to the left of it upon entering. According to preconstruction specifications, doorways in the barracks were to be 6 *pieds* high by 2 *pieds* 9 *pouces* wide with a 2-*pouce* check in the jambs and arch. The doors were to be made of 1-*pouce* vertical pine boards 5 *pouces* to 6 *pouces* wide morticed into horizontal rails at top and bottom.[18] A repair estimate for 1736 mentioned replacing glass in the transom above the door.[19] The shutters for windows in the barracks were to be of an unusual type. Their basic construction was common, like the doors, but the lower horizontal rail was a 2-*pouce*-thick pine plank with a loop-hole in the middle, 2 *pouces* in diameter. The hole was closed by a sliding shutter.[20]

Floors in the barracks were to consist of 2-*pouce*-thick planed planks supported on 4 *pouce* by 4 *pouce* joists spaced one *pied* 8 *pouces* apart. A fill of charcoal, cinder or gravel was to be inserted between the joists to counteract dampness.[21] However, some elevations drawn after the construction of the battery show cobbled floors in the barracks.

The ceilings of the rooms were also to be made of 2-*pouce* pine planks *"bien clouées sur des soliveaux a vive equaire Espacée egallemen les uns des autres, les poutrelles seront portées par les mur de refans sur leur forts."*[22] The meaning of *soliveaux* as used in this statement is uncertain. It seems to refer to the joists yet its more normal use is for small joists attached to the framing around a fireplace. Similarly *poutrelles* normally means large joists. Possibly, since they are elsewhere described as being spaced one *pied* 8 *pouces* apart, the *poutrelles* formed a first layer of joists with *soliveaux* laid across them to form a second layer. This would account for the planks

14 Historical plan of the Royal Battery barracks guardrooms (undated). The soldiers' quarters are to the left of the passageway and the officer's quarters share the right side with the cell. From a plan entitled "Batterie Royalle de 40 canons . . . dans le por de Louisbourg a Lisle Royalle." *(Original source unknown, copy in the Public Archives of Canada.)*



14

15 Historical plan of the early barracks guardhouse, 1720. This plan shows one of a number of configurations for the guardhouse. It is located at the top right of the barracks square with the cell and dungeon adjoined to one end. From a plan entitled "Plan De Louisbourg Avec Ses Augmentations faites pendant l'année 1720." *(Archives du Génie.)*

15

being nailed to the *soliveaux* and not the *poutrelles*.

Inside the room there was a small fireplace set across the north-east corner. A *lit de camp* extended along two-thirds of the length of the west wall.

Soldiers' Guardroom

The soldiers' room occupied the full width of the barracks on the west side of the passageway. It was 21 *pieds* long and widened from 12 *pieds* on the ditch side to 18 *pieds* on the side facing the terreplein. Some plans show three symmetrically splayed loopholes in the north wall; others show only one. There was a window in the south wall and a doorway to its left upon entering.

The window appears to be the same type as those in other barracks rooms, which were described as sash-windows set in frames 2 *pieds* 9 *pouces* wide by 3 *pieds* high, with panes 8 *pouces* by 6 *pouces* held in position by glaziers' points.[23]

In the middle of the south wall there was a fireplace that was part of a back-to-back unit shared with the adjoining barracks room. These fireplaces were to have tiled hearths resting on bases one *pied* 6 *pouces* deep and 4 *pieds* wide.[24] The fireplace itself was 3 *pieds* high. A *lit de camp* ran the whole length of the north wall. In 1736 it was noted that two new hinges and a pull-ring were needed for the trap door to the *bascule* room; a staircase or ladder was to be installed leading to the attic, and glass was to be replaced in the transom windows above the door.[25]

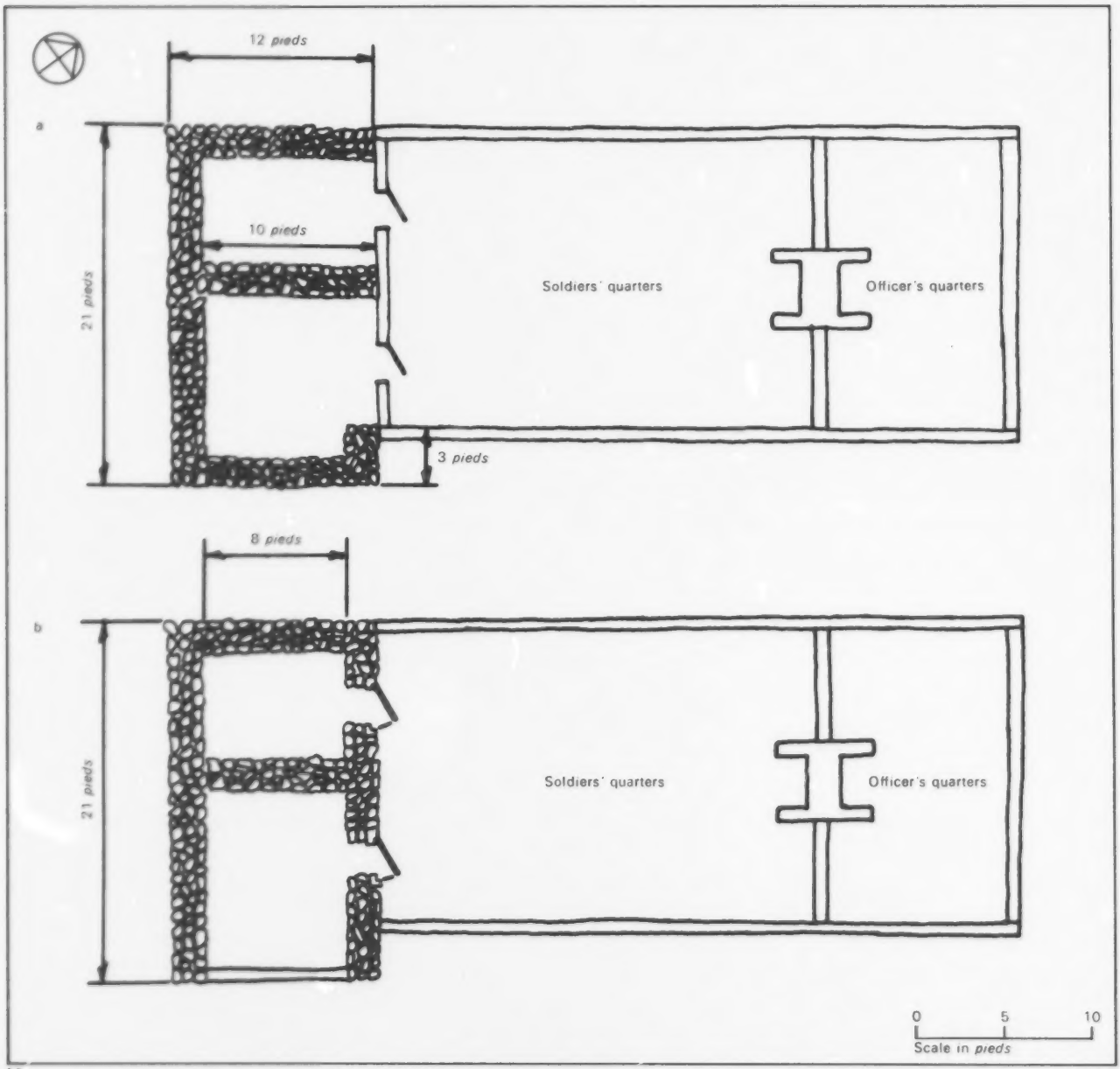
Barracks Guardhouses

The major difference between barracks guardrooms and barracks guardhouses was that the guardhouses were not integral parts of the buildings which they served. Four are known at Louisbourg: one associated with an early wooden barracks built to house troops while the King's Bastion barracks was being built; one associated with the barracks of the island battery; one associated with the Queen's Bastion barracks built by the English, and one associated with the barracks in the area of the town known as the Ile du Quay located between the Grand Etang and the quay wall. It is possible that the guardhouse on the Place d'Armes was converted to this function after the construction of the Pièce de la Grave guardhouse, but since it was built for the purpose of housing the town guard it is discussed under that heading.

Early Barracks Guardhouse

The early barracks guardhouse first appears in historical plans in 1720 (Fig. 15) where it forms part of the east side of a square bounded on the other three sides by barracks. It was built to replace an earlier guardhouse-prison situated in Block 16. This earlier building had proved to be inadequate, since prisoners had escaped from it in 1717; therefore, the decision was made in 1718 to build a new guardhouse-prison the following year.[1] The building enjoyed only a short life since the barracks and guardhouse were demolished about 1723 to make way for the glacis of the townside Place d'Armes of the King's Bastion. Although much of this area has been excavated, no trace of this guardhouse has been found.

16 Hypothetical ground plans of the early barracks guardhouse/prison. *a*, shows masonry exterior walls for the prison with an interior wooden partition to the guardhouse; *b*, shows a wooden east wall on the prison. Both arrangements fit the specifications closely, but *a* seems more logical.



16

Prison

The size of the prison, which was a masonry building, is known from a record of the digging of its foundations which were 21 *pieds* long by 12 *pieds* wide.[2] The walls were 9 *pieds* high and 2 *pieds* thick. A *toisé* mentions three masonry perimeter walls and a dividing wall between the prison cell and the *cachot* (a windowless cell or dungeon). The total length of masonry wall is given as 58 *pieds*.[3] Two alternative breakdowns of this figure can be made to fit the three perimeter walls and a dividing wall (Fig. 16, *a, b*). With the first arrangement it has been assumed that the measurements were taken from the outside corners of the perimeter walls and along the dividing wall from its junction with the outer wall. Since the figure of 58 *pieds* comes from a post-construction *toisé*, this would be a plausible system of measurement. This arrangement totals 55 *pieds* and allows an arbitrary 3 *pieds* for a short return wall at the northeast corner where the prison joins the narrower guardhouse. The advantage of this arrangement of walls is that it leaves the north wall that is common with the guardhouse to be made of wood, rather than a wall opening to the outside as in the second arrangement. Since a wooden wall is easier to pry apart and was the means by which prisoners had escaped from the earlier prison, it is logical that it would open on the interior of the guardhouse. This wooden wall was probably built from 10 planks 12 *pieds* long, 10 *pouces* to 12 *pouces* wide and 2 *pouces* thick that were purchased for the guardhouse.[4]

The roof, which is sometimes shown as hipped and sometimes gabled, consisted of *piquets* and rafters with a covering of *plans de bois* topped with *plans de terre* and moss.[5]

The internal division into a cell and dungeon is mentioned but not described. Each room had a door made of tongued and grooved fir boards reinforced with three horizontal wooden battens. The door to the cell was 2 *pieds* 6 *pouces* wide but only 4 *pieds* high, and the door to the dungeon was even lower, 3 *pieds* 6 *pouces*.[6] Logically these doors would have opened into the guardhouse for security reasons.

Grilles for the prison are mentioned, but since it is uncertain whether there was a window in the building, it cannot be determined whether the grille was set in a window opening or in the doors.

Bolts and padlocks, probably for the prison doors, are mentioned in a list of hardware for the prison and guardhouse.[7]

Guardhouse

No mention is made of the size of the guardhouse. Scaled from an historical plan it appears to have been approximately 18 *pieds* wide by 37 *pieds* long. There was an officer's room at one end of the building probably at the opposite end from the prison.[8] The remainder of the building contained the soldiers' quarters.

The *toisé* lists *piquets* for surrounding the guardhouse, and payments made to workmen *"qui ont attaché les piquets de l'enceinte du corps de garde."* Although *enceinte* normally refers to a fence there is evidence that in this case it signifies the walls of the guardhouse. First, historical plans which show the guardhouse indicate no fences nearby, but do show fences elsewhere. Second in the *toisé*, which admittedly is ambiguous and vague, no mention is made of any other walling material. Third, of 22 examples of buildings at Louisbourg with roofs covered with *plans de bois* and *plans de terre*, as this one was, and of which the walling material is known, 21 had *piquet* walls.[9] Thus, although each piece of evidence is not conclusive in itself, there is a strong circumstantial case to be made for suggesting that this building had *piquet* walls.

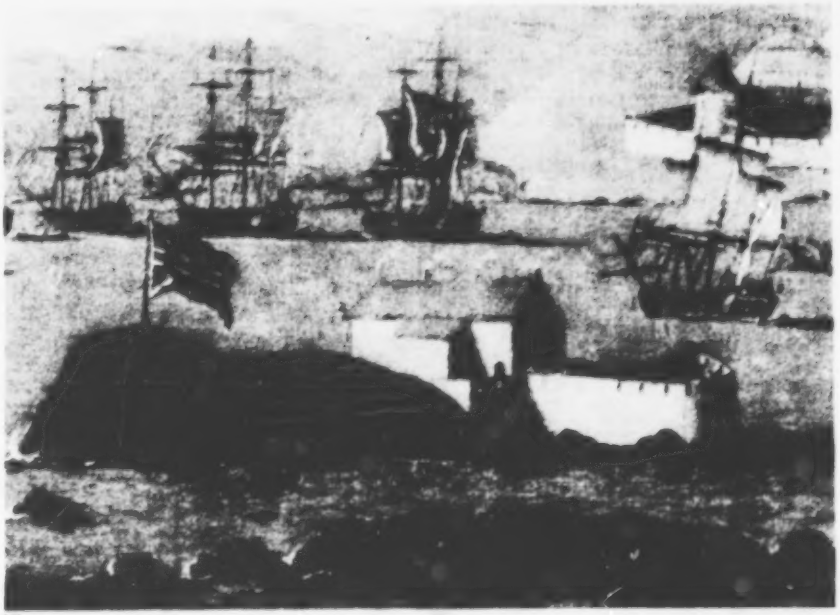
Some of a group of 150 fir boards 10 *pieds* long, 10 *pouces* to 12 *pouces* wide and one *pouce* thick, were used to *"faire la chambre de l'officier."*[10] This may mean either that the wall dividing the officer's room from the remainder of the building was made of boards, or that the entire room was sheathed with boards over the *piquets*.

The roof of the guardhouse was similar to that of the prison except that no *piquets* were reported as being used.

Two doors are described, one *d'entrée*, and the other *"à la chambre de l'officier."* Both were 6 *pieds* high and 3 *pieds* wide, made of fir boards, planed on both sides, tongued and grooved and reinforced with three horizontal wooden battens.[11]

There were three windows in the prison and guardhouse together, but we do not know if any of them

17 Painting of Battery Island entitled "The Taking of Louisbourg," 1745. The small addition to the main building may be the guardhouse. *(National Maritime Museum, Greenwich, England.)*



17

were in the prison. Their sashes were made 4 *pieds* high by 3 *pieds* wide, and the openings were covered with shutters made in the same way as the doors but with only two battens.[12]

There was a double fireplace, presumably set in the dividing wall between the officer's and soldiers' rooms. The only detail known of this is a record of paying for iron bars, presumably the relieving bars under the mantlepiece.[13]

A floor for the guardhouse was made, probably from some of the 150 fir boards. These boards were used for a number of specified items and *"autres chose necessaire."*[14] Allowing a generous amount of wood for all the specified uses, there is still over 700 square *pieds* left over which would be ample to cover the guardhouse floor area.

The only information available on furnishings is that both officer and men had beds, of unknown type or size, made from fir boards 1 *pouce* thick.[15]

Battery Island Barracks Guardhouse

Initially it was intended that the guardhouse for Battery Island be incorporated within the barracks. It is shown as such on some early plans, one showing it with a porch along the north side. However, it was later decided to erect a separate guardhouse, which was built at the same time as a bakery in 1744.[16] It is almost impossible to be sure exactly where this guardhouse was situated. Evidence from historical plans is slight, confusing and contradictory. Documentary evidence shows that the building was attached to the barracks, and one painted view and a few later vague sketches show some sort of addition to the south side of the barracks (Fig. 17).

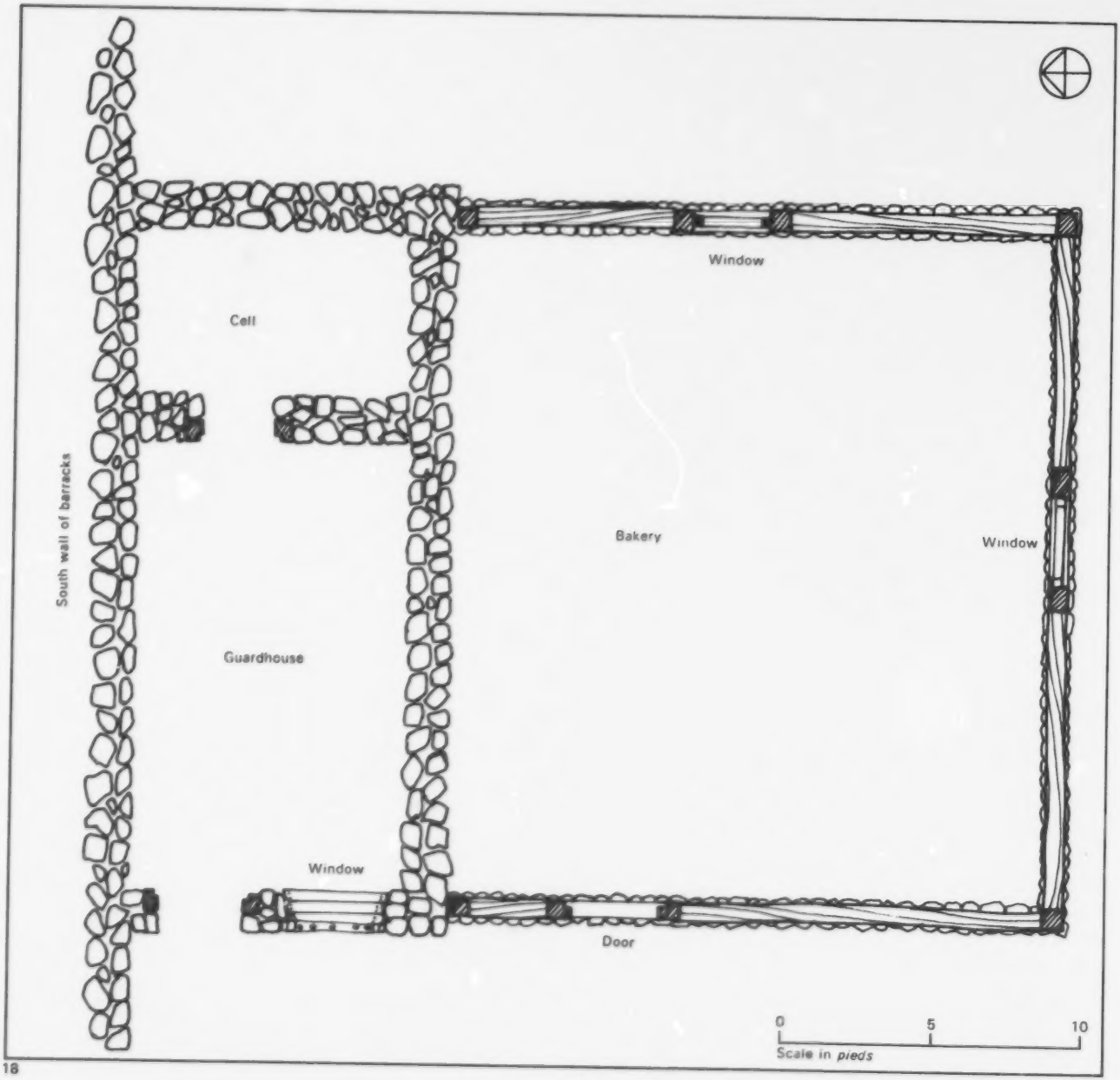
According to the *toisé* drawn up to account for work done on the guardhouse in 1744, the building was divided internally into soldiers' quarters and cell. The officer presumably continued to reside in the barracks.

In the *toisé* total lengths of materials were given instead of individual units. Consequently much of the following is an interpretation of the probable wall lengths, rafter spacing and so on. A further complication is that the *toisé* included materials for the bakery. From the intermingling of items of both buildings it would seem that they were contiguous.

Six items in the *toisé* suggest the size and arrangement of the two buildings.

1)	Foundations of the cell and guardhouse including the dividing wall:
	Total length, 52 *pieds*
	Thickness, 1 *pied* 6 *pouces*
	Average height, 1 *pied* 6 *pouces*
2)	Floor of guardhouse:
	Length, 15 *pieds*
	Width, 9 *pieds*

18 Hypothetical ground plan of the Battery Island barracks guardhouse. This arrangement fits the *toisé* measurements closely. The only major possible alteration is to reverse the positions of the guardhouse and cell.



18

3) Ceiling of guardhouse, cell and bakery:

Length, 32 *pieds*

Width, 24 *pieds*

4) Plank revetment around the bakery, guardhouse and cell:

Total length, 33 *pieds*

Average height, 8 *pieds*

5) Foundation for the bakery:

Total length, 64 *pieds*

Thickness, 1 *pied*

Average height, 1 *pied*

6) The hip:

Average width, 12 *pieds* 6 *pouces* (half the width of the roof)

From the dimensions given for the ceiling we know that the building was approximately 24 *pieds* wide, and 32 *pieds* long. Elsewhere in the *toisé* we find that there was only one hip on the roof, so most likely the long axis was at right angles to the adjoining barracks. With this information and, in addition, interpretation of the phrase *"les deux faces de la Boulangerie du Corps de Garde et de la Prison joigt. les cazernes"* to mean that the cell and probably also the guardhouse were immediately adjacent to the barracks, it is possible to draw up a reasonably accurate plan of the two buildings (Fig. 18).

The only arrangement that can satisfy the above criteria plus the 52 *pieds* total length of masonry wall foundation for the guardhouse and cell, and also create a guardhouse with a floor area 15 *pieds* by 9 *pieds*, is to use the south wall of the barracks for one side of the building and arrange the rooms as shown in Figure 18. The only variation possible is to reverse the positions of guardhouse and cell by moving the dividing wall to the west. Similarly, the only arrangement that will satisfy the 64 *pieds* of frame and *piquet* walling of the bakery and the total length and width of the two buildings, 32 *pieds* and 24 *pieds* respectively, is to use the north masonry wall of the guardhouse as a common wall. This arrangement creates a total length of outside walling of 88 *pieds* which is exactly the length of plank revetment stated by the *toisé* as covering both buildings.

Although the total horizontal length of *piquet* walling for the bakery is only 47 *pieds*, compared with 64 *pieds* of foundations, the use of 92 *pieds* of 10 *pouce* by 10 *pouce* pine divided into framing posts, plus the gaps for doors and windows, could adequately be made to cover the difference.

The distance from the top of the foundations to the top of the masonry fill under the furring was given as 7 *pieds* 7 *pouces*. However, if the *toisé* is to be believed, the top of the foundations was 1 *pied* below the top of the foundation trench. This situation would result in walls 6 *pieds* 7 *pouces* high less the height of the fill under the furring, leaving a net height of approximately 6 *pieds*. Since this is abnormally low by comparison with other buildings at Louisbourg, it would seem that the *toisé* is in error in its account of either the height of the foundations or the depth of their trench.

The roof of the building is mentioned in six items.

1) For one truss:
The two principal rafters, the tie-beam, the king post:

Combined length, 41 *pieds*

[Wood] size, 7 *pouces* by 8 *pouces*
And for two others the same.

2) The two hip rafters of the hip:

Combined length, 46 *pieds*

Size, 6 *pouces* by 7 *pouces*

3) The ridge:

Length, 33 *pieds*

Size, 6 *pouces*

4) Purlins, common rafters and furring together:

Combined length, 624 *pieds*

Size, 4 *pouces* by 4 *pouces*

5) The two faces of the bakery, the guardhouse and the cell joining the barracks:

Average length, 32 *pieds*

Total width, 33 *pieds*

6) The hip:

Average width, 12 *pieds*, 6 *pouces*

Heigth, 12 *pieds*

With these details it is possible to reconstruct the type of roof and to suggest within a close range of prob abilities a number of its details.

The roof had two long faces and a hip. The length of the ridge, 33 *pieds*, on a building 32 *pieds* long,

apparently contradicts this. However, the upper part of the roof would have been framed into the roof of the one and one-half storey barracks at the north end. At the ridge level this meant that the guardhouse-bakery roof extended 7 *pieds* to 8 *pieds* over the barracks roof, thereby leaving adequate room for a hip at the other end.

The total width of the faces of the roof, 33 *pieds*, and its height of 12 *pieds* on a 24-*pied*-wide building, allowing for furring and overhang, suggests a pitch of approximately 45° on the faces and approximately 60° on the hip.

The basic frame of the roof consisted of three trusses which consisted of two principal rafters, running from the wall plate to the ridge, reinforced with a vertical king post and a horizontal tie-beam. One of these trusses was at the junction of faces and hip; one probably was placed above the common wall between guardhouse and bakery, and the third was probably at the junction between guardhouse and barracks.

Between the trusses the roof was framed with common rafters supported on purlins. From the total length given for common rafters, purlins and furring, 624 *pieds*, a reasonable arrangement would have left 2-*pied* spacing between rafters, a single row of purlins half way up the sides, and furring about 3 *pieds* long. It must be emphasized, however, that these figures are entirely calculated on the basis of what appears reasonable, and some variation is possible. The area under the eaves between the rafters and the wall plate was filled in with masonry. The measurement given for this masonry suggests that only two side walls were filled and not the hip; or, less likely, that there was no furring under the hip.

Missing from this account of the roof framing is mention of a wall plate for the guardhouse. Also missing from the roof items is any mention of a covering between the shingles and the rafters. This covering could have been either laths for nailing the shingles, or, more commonly at Louisbourg, boards covering the whole roof laid either horizontally or vertically.

There were two doors in the guardhouse, one for the guardhouse proper and one for the cell. The cell door probably was set in the dividing wall for convenience and security.

The guardhouse door was 5 *pieds* 8 *pouces* high by 3 *pieds* wide and set in a wooden frame. The door was fashioned of vertical pine planks 2 *pouces* thick, tenoned at both ends into horizontal hardwood rails. The 40 *pieds* of 7 *pouce* by 8 *pouce* framing given for this and the prison door allows for a frame consisting of two jambs, a lintel and a sill. The door for the cell was similar to that for the guardhouse except that it was only 2 *pieds* 4 *pouces* wide. Hardware for these doors consisted of 2-*pied*-long hinges pivoting on iron pintles, a surface-mounted lock with one or more bolts (*serrures à bosse les verrouils compris*), probably for the cell, and two rim-locks (*serrures Bernades*) for the guardhouse and bakery. Two latches are listed in the *toisé* for the guardhouse, cell and bakery without being specifically assigned to any of these rooms.

There was one window in the guardhouse, logically on the west wall. The *toisé* mentions two *châssis* for this window, one of pine and the other of oak. In addition, oak *châssis* are noted in the bakery. However, elsewhere it is noted that the frames of the bakery windows were at least partially constructed of heavy pine posts used in the wall framing. The most logical conclusion to be drawn is that the word *châssis* is being used in two senses, one to mean the window frame and the other to mean the sash. This would lead to the conclusion that sashes were all oak and the frames were pine, whether constructed from the wall framing as in the bakery, or made separately as in the guardhouse. The pine frame for the guardhouse consisted of 16 *pieds* of 6 *pouce* by 7 *pouce* wood, and the oak sash was 3 *pieds* 8 *pouces* high by 3 *pieds* 4 *pouces* wide. This window was covered with shutters of one-*pouce* pine boards.

The hardware list for the guardhouse and bakery does not mention any hinges or other hardware for the shutters. It does, however, include *fiche à vase* hinges for the windows, allowing for two on each side of a double-leaf casement window; jamb anchors, allowing four per window for holding the frame into the masonry; and spring bolts, two per window, which normally were fastened vertically to the top and bottom of the

casement sash. The panes of glass were 7 *pouces* by 8 *pouces*, which would mean that there were four rows of five lights. In 1749, the window sash was repaired and glass of a new size, 8 *pouces* by 8 *pouces* was installed.[17]

The *toisé* called for a ceiling stretching throughout both buildings, made of 2-*pouce*-thick pine planks nailed to 7 *pouce* by 8 *pouce* joists set at a calculated 4-*pied* spacing. The guardhouse had a wooden floor made of similar planks. The only framing mentioned consists of 30 *pieds* of 6 *pouce* by 7 *pouce* pine joists. This length of framing may have served as a sleeper along each side of this 15-*pied*-long room. However, the planks would have to span a 9-*pied* gap between them. The most probable explanation of this anomaly is that other joists were omitted from the *toisé* or included in the quantity of joists for the ceiling.

It is not clear whether the list of furnishings given in the *toisé* is for the guardhouse alone or for both buildings. The list consisted of three tables 6 *pieds* by 2 *pieds* with *"leur pieds d'assemblage"* (this phrase is of uncertain meaning but probably refers to horizontal stringers fastened near the base of the legs to prevent splaying; (*see* Fig. 11), six benches 6 *pieds* long and a folding table in whitewood (for the bakery?), 4 *pieds* by 2 *pieds* 6 *pouces*. All except the last item were made of birch. In addition the prison and guardhouse had *lits de camp* 6 *pieds* wide made of 2-*pouce* pine planks resting on a framework of 5 *pouce* by 5 *pouce* pine joists.

Ile du Quay Guardhouse

The site of this building has not been located and its existence is suspected only on indirect evidence. In 1755, a list of guard posts at Louisbourg was drawn up starting at the King's Bastion and proceeding in a clockwise direction around the town.[18] Between the Pièce de la Grave guardhouse and the Maurepas Gate guardhouses, a post was listed at the *"cazernes."* In the same year a large reinforcement of troops arrived at Louisbourg.[19] A shortage of barracks accommodation meant that some of them were settled in the town, although there is no documentary evidence of exactly where. However, in 1758 a plan was drawn of the Ile du Quay area, which is between the Pièce de la Grave and the Maurepas Bastion, on which appeared the legend *Cazernes de L'Etang*.[20] A reasonable interpretation is that the Ile du Quay area was taken over by the government to house troops and that a guardhouse was established among them to keep them under control. Since the building has not been located it is not possible to determine whether it was a separate guardhouse or guardrooms within a larger building.

Queen's Bastion Guardhouse

Virtually nothing is known of the guard post in the barracks built by the New Englanders (1745-49) in the Queen's Bastion. The only reference to it comes from a French repair list of 1749 which describes the installation of *lits de camp* and *armoires de consine* in both officer's and soldiers' quarters, and a large stove for the latter.[21] It is not possible to determine whether the post was free-standing or incorporated in one of the barracks buildings. Perhaps the post for the *cazernes* mentioned in the 1755 list was this one, but since it would be in conflict with the apparent clockwise order of the list it seems unlikely.

The same repair list that mentions the guardhouse furniture also mentions six posts planted in the yard of the barracks, each 6 *pieds* high with placards *"pour judiquer la destination des gardes."*[22]

Gateway Guardhouses

Gateway guardhouses were to be found at the three gates through the fortifications. The Dauphin Gate next to the Dauphin Demi-bastion and the Queen's Gate between the King's and Queen's bastions both led through the major line of fortifications on the western boundary of the town, and the Maurepas Gate between the Maurepas and Brouillan bastions led through the fortifications on the eastern boundary.

Dauphin Gate Guardhouses

The Dauphin Gate controlled most of the traffic entering and leaving Louisbourg on the landward side. It was flanked by guardhouses on either side of the roadway (Fig. 19). The guardhouses differed from those at the other gates in two ways. First, since there was no rampart behind the gate, both used the rear of the masonry revetments flanking the gate as one of their end walls. Second, because of the presence of the semi-circular bat-

tery on the left side (looking outward from the town) and the quay wall on the right side, both buildings were incorporated as integral parts of these structures.

The first guardhouse to appear on any plans was the soldiers', to the west of the gate. Work on this building was finished by late 1729.[1] The officer's guardhouse did not appear until 1733. Both guardhouses seem to have remained unaltered until 1745, when they were filled with rubble to strengthen the area around the gate during the first siege.[2] After the siege both guardhouses were restored to normal use and were occupied intermittently until 1755-56, when they were filled with rubble as part of a permanent stone rampart erected behind the Dauphin Gate.[3] The whole area was effectively demolished by the English in 1760 together with the other fortifications. In the 1930s a metaled road was laid through the site of the gateway and officer's guardhouse. Laying the bed for this road obliterated all but the lower part of the foundations of this building. The combination of filling, demolition and road-building resulted in the survival of little more than the outline of the buildings when the site was excavated. (Fig. 20).

Officer's Guardhouse

The officer's guardhouse was situated in the angle between the quay wall and the back of the revetment flanking the right side of the gate (looking from inside the fortifications), using the revetment as its northwest end wall. The back wall was built on top of the 8-foot-thick foundations of the quay. The front and southeast end walls were free-standing.

According to Franquet, in 1751 the over-all size of the building was 16 *pieds* 6 *pouces* long by 15 *pieds* wide.[4] With a northeast wall on top of the quay wall 3 *pieds* thick and the two free-standing walls 2 *pieds* thick, the internal measurements would have been 14 *pieds* 6 *pouces* long by 10 *pieds* wide. However, the most detailed plan of the guardhouse from which the wall thickness is calculated shows it to be almost 13 *pieds* wide (Fig. 19). It seems, therefore, that Franquet had not included the thickness of the northeast wall in his exterior measurements.

Excavation showed that the foundations were those of the guardhouse after it had been incorporated within the stone rampart built behind the gate in 1755-56. This had involved thickening the free-standing end wall to 9 *pieds* to act as an internal buttress, and thickening and extending the front wall to 6 *pieds* to act as a retaining wall for the rampart. However, if the original southeast and front wall dimensions (as determined from the historical plan) are superimposed on the inner edges of the surviving foundations, and the northeast wall is superimposed on the outer edge of the quay wall foundations, the resulting guardhouse is almost exactly the same size as that shown on the historical plan.

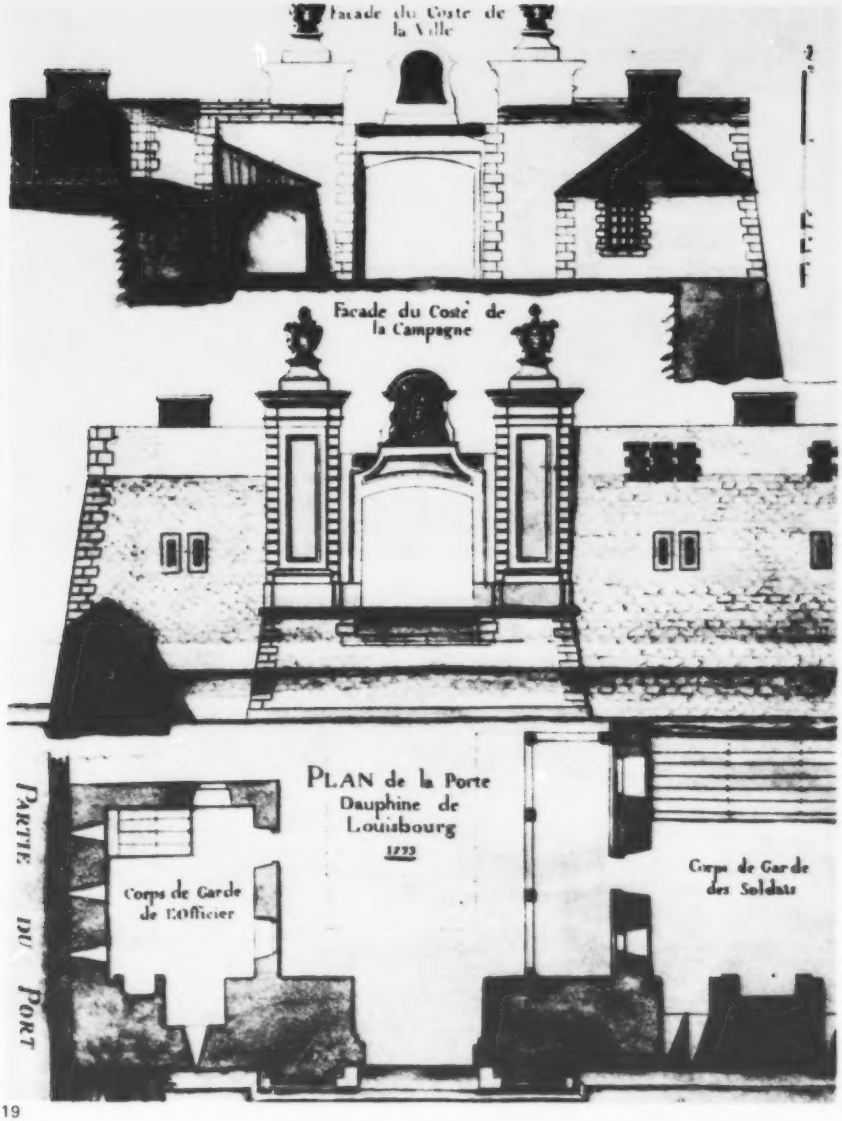
The historical plans show a single-storey masonry building with cut-stone quoins whose batter on the northeast wall continued that of the quay wall below. The outside surfaces of the walls were covered with rough-casting in 1750.[5]

The southwest or front wall had a doorway 2 *pieds* 9 *pouces* wide with a window to the left of it upon entering. There was another window in the southeast wall; both were 3 *pieds* wide, and both had shutters. The elevation from behind the gate shows the southeast window and its surround. Some of the remains of the original cut-stone surrounds of doors and windows were found built into the nearby quay wall which had been rebuilt during the New Englanders' occupation between 1745 and 1749, partly with stones taken from the ruined guardhouses. The doorway surround stones were typical of those found on other military buildings at Louisbourg. The stones of the jambs were cut square on the outside, with a 2-*pouce* check for an inward-opening door, and a flare behind the check on alternating courses. The window surrounds were also typical with a one-*pouce* check at the outer edge for the shutter, and a 2-*pouce* check inside for the wooden window frame.

The shingled roof of the guardhouse was hipped at one end and butted against the back of the revetment at the other. No details of the framing of the roof are known, but the historical elevation shows it with a 38° pitch.

According to one historical plan there were three loopholes in the quayside wall, but in an elevation on another, four loopholes are shown, with cut-stone surrounds.

19 Historical plan and elevation of the Dauphin Gate and its guardhouses, 1733. (*Archives Nationales.*)


Facade du Coste de la Ville
Facade du Coste de la Campagne
PLAN de la Porte Dauphine de Louisbourg
1733
Corps de Garde de l'Officier
Corps de Garde des Soldats
PARTIE DU PORT

19

Inside the guardhouse there was a small fireplace in the north corner of the revetment wall. Construction of the fireplace had involved blocking one of the two loopholes that originally looked out over the ditch before the guardhouse was built. The other loophole was left open, presumably with some sort of cover for protection against the weather. The fireplace apparently fell into disuse after the return of the French in 1749, since the next year a medium-sized stove was installed.[6]

There was a *lit de camp* 7 *pieds* long by 4 *pieds* wide in the south corner of the room. In 1753, Franquet noted the presence of an armchair, a table, a full-sized *armoire*, a half-sized *armoire* and a trestle.[7]

There was no porch along the front of the building since it would have obstructed passage of traffic through the gateway. Along the front and end of the building there was a cobbled sidewalk.

Soldiers' Guardhouse

The soldiers' guardhouse was fully incorporated within its surrounding structures. The northwest end wall was the revetment to the left of the gate. The southwest and southeast walls were the profile retaining walls of the ramparts of the right face of the bastion and the semi-circular battery respectively. The northeast or front wall was a narrow continuation of the revetment of the semi-circular battery.

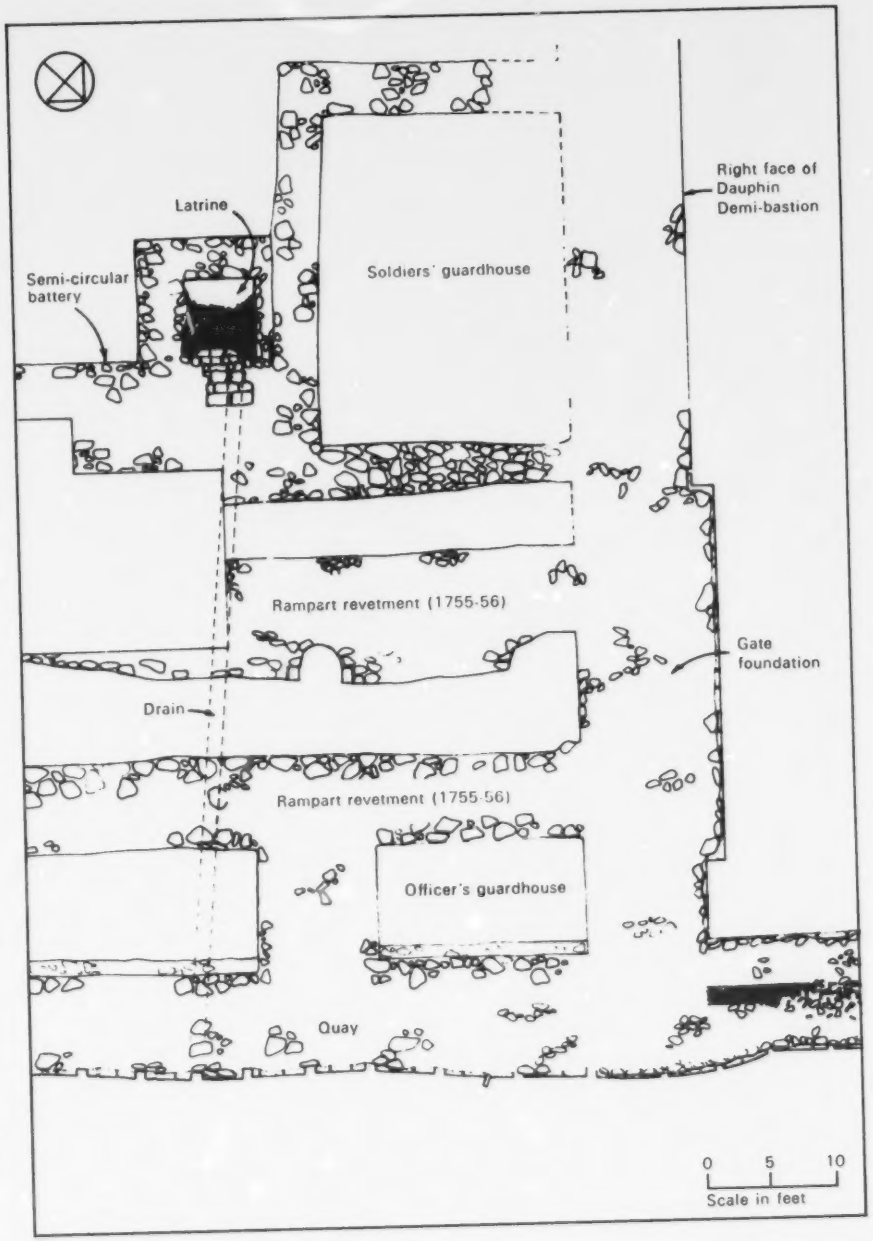
20 Excavated remains of the Dauphin Gate and its guardhouses.

The guardhouse is shown with a wide variety of shapes and sizes on historical plans, and according to Franquet, in 1751 it was 22 *pieds* long by 19 *pieds* 6 *pouces* wide.[8] The excavated remains indicated a building 33 ft. long by 23 ft. wide (Fig. 20). However, a change in the character of the masonry from well-built solid foundations to a shallow rough foundation near the southwest or back wall suggests that at some time the guardhouse had been extended. The side-to-side measurement of 23 ft. is close to the 22 *pieds* length given by Franquet.

Since the guardhouse was razed in 1755-56, all that survived when excavated were the remains of the foundations. None of the superstructure of the building remained.

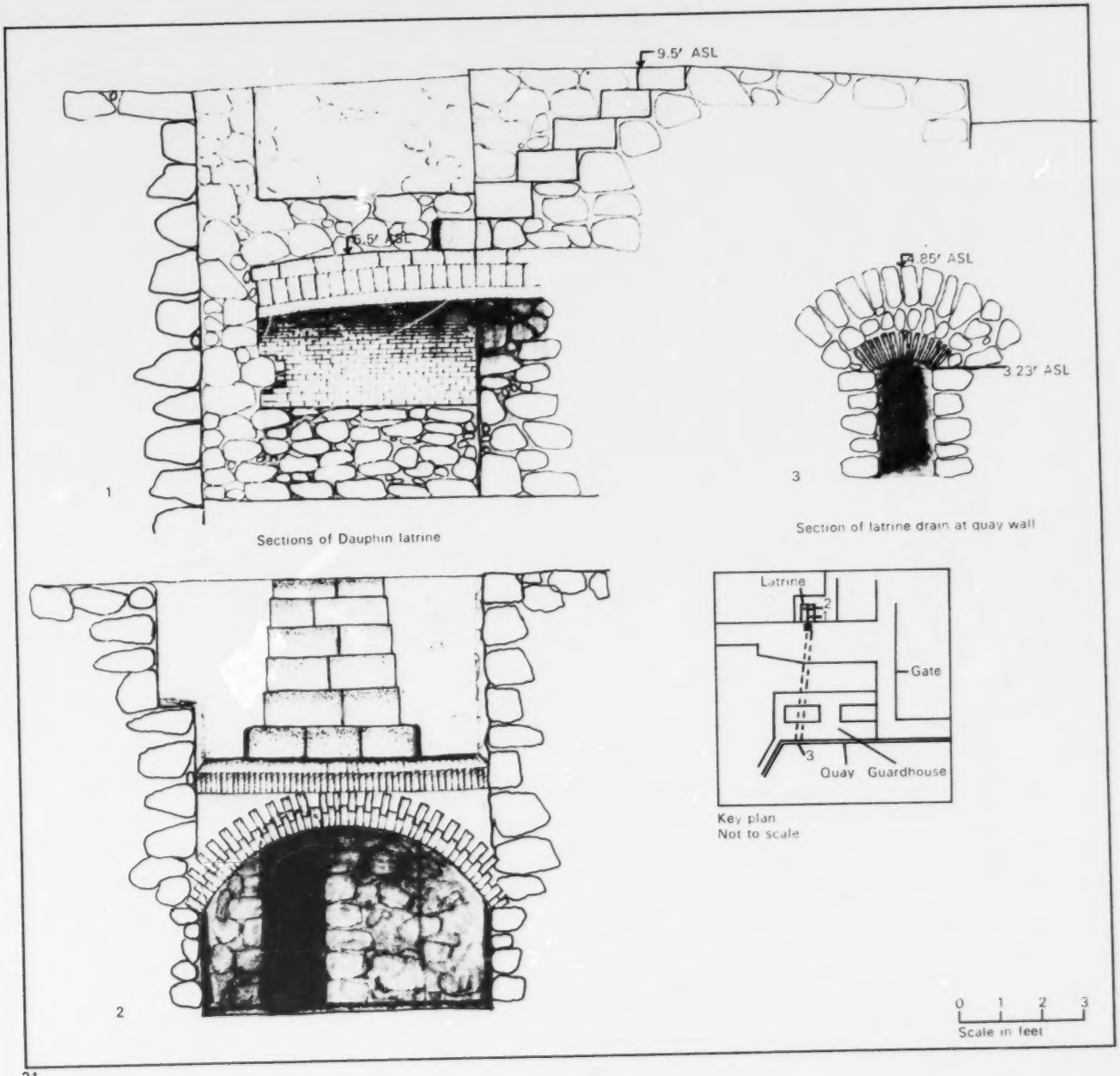
According to the plans there was a doorway 3 *pieds* 3 *pouces* wide in the centre of the front wall with a full-sized window to the left of it upon entering, and a small window to the right that first appears on plans sometime after the guardhouse was completed. The full-sized window had a shutter, but the smaller one did not. The front wall was a continuation of the revetment of the semi-circular battery, which had a batter of 1 in 6, and a number of jamb stones from the doorway found nearby also had this batter on their outer faces. The stones had checks 2 *pouces* deep for an inward-opening door pivoting on the left.

In the revetment wall there were four lower loopholes with cut-stone surrounds set in pairs in two separate alcoves, one on either side of the



20

21 Excavated remains of the latrine of the Dauphin Gate guardhouses.



fireplace. Above these were six more loopholes with brick surrounds set in two groups of three. How these upper ones were serviced is not clear; presumably there was some sort of wooden platform with a ladder leading up to it. The lower loopholes were asymmetrically splayed on the inside so their field of fire could cover the bridge across the ditch outside the gate.

The shingled roof of the guardhouse before 1745 had a single slope running down from the top of the revetment wall beside the gate to the level of the rampart of the semi-circular battery at the southeast wall. After 1745, the guardhouse was rebuilt with a pyramid roof that was also covered with shingles.[9]

The repairs to this building made by the New Englanders between 1745 and 1749 included rebuilding the front wall, apparently to a thickness of 7 *pieds*, in the process omitting any windows and creating an arched entrance at the north end of the wall.[10] Part of this arch, in brick, was found during excavation lying in the rubble outside the guardhouse. No trace of the rebuilt wall was found; presumably, therefore, it was built without substantial foundations. This wall was said to have been covered with rough-casting in 1750.[11]

Between the alcoves for the loopholes there was a fireplace 4 *pieds* 6 *pouces* wide. The chimney from this fireplace is shown emerging through the revetment wall beside the gate. The chimney itself was brick with a cut-stone cap. As with the officer's guardhouse, the fireplace was replaced by a brick stove after the French returned in 1749.[12] At the same time a large charcoal-fired grille was put back in place in case of need. Apparently this stove was removed in summer and its foundations covered with temporary flooring.

Along one wall an historical plan shows a *lit de camp* 7 *pieds* wide. In 1753 there were two *lits de camp*, a table, three benches and seven arms racks in the room.[13]

Along the front of the building there was a porch with a roof supported on four or five posts creating two or three bays along the front and one at the end. According to the plan the porch was 7 *pieds* wide and 22 *pieds* long. However, excavations have shown that the gap between the guardhouses was considerably narrower than that shown on the plan – so narrow in fact, that the porch must have been narrower than is shown to avoid blocking the gate.

An elevation shows the posts anchored in a sill beam and bevelled at the corners. At the top, curved bracing held them firmly to the plate. Close parallels for this type of gallery exist in surviving 18th-century guardhouses in France (Fig. 5).

Beside the guardhouse to the south there was a latrine, the only indication of which from historical sources is an elevation that shows the doorway leading into it. Construction of the Cavalier Battery behind the ruins of the semi-circular battery in 1745-49 had made this latrine unserviceable, but because it was subterranean, only the upper portion had been removed (Fig. 21).

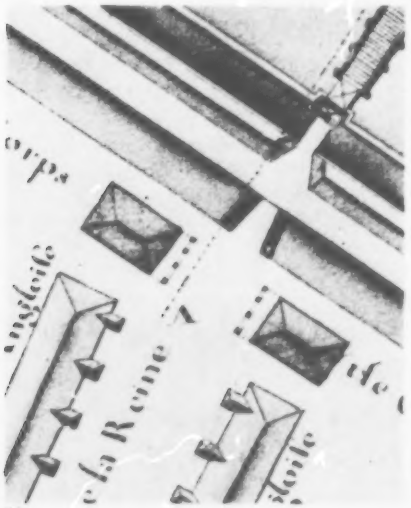
Excavation showed that the floor of the latrine was 4.5 ft. below ground level and was reached via a flight of six cut-stone steps cut in the 10-foot-thick foundations of the semi-circular battery. At the bottom was a small room approximately 6 ft. square with a double brick floor supported on a double brick arch and covering three-quarters of the room area. The remaining quarter along the wall opposite the steps was open and led down to a stone-lined sump defined by the foundations of the latrine. A masonry drain 1.3 ft. wide covered with mortar led out from the sump, through the foundations of the semi-circular battery, under the roadway and through the quay wall. The opening through the quay wall was blocked off when the wall was rebuilt by the New Englanders between 1745-49.

Queen's Gate Guardhouses

The Queen's Gate guardhouses were situated on either side of the roadway at the foot of the rampart through which the gate was cut. The officer's guardhouse was to the west, the soldiers' to the east of the gateway. Both had their long axes at right angles to the roadway (Fig. 22).

A document of 1738 noted that work on the two guardhouses was finished and the guard would be moved into them as soon as the wooden bridge across the ditch was completed.[14] No further mention of the guardhouses is made until 1749 when extensive repairs were carried out.[15] In 1753 it was stated that the officer's room was occupied by two

22 Historical plan of the Queen's Gate guardhouses, 1751. The officer's quarters and armoury are on the right and the soldiers' quarters and latrine are on the left. From a plan entitled "Plan des deux fronts de fortification, l'un d'entre le Bastion de la Reine cotté 2, celui de Princesse cotté 1, et l'autre d'entre de dit Bastion Princesse cotté 1, et celui de Brouillan cotté 10." *(Archives du Génie.)*



22

miners sent out from France, and the arms-room, which made up the remainder of the officer's guardhouse, was then in use as a cell.[16] The officer's guardhouse does not appear on an English plan of 1767, probably because it had been razed or buried during the demolition of the fortifications in 1760.

Neither of the guardhouses had been fully excavated, but the outlines of both are clear on the surface, and some test excavation was carried out by J. Russell Harper in 1962.[17]

Officer's Guardhouse

According to Franquet, the officer's building was 30 *pieds* long by 20 *pieds* wide with a central dividing wall creating two rooms 12 *pieds* long, one for the officer and one for the arms.[18] From these measurements it can be deduced that all masonry walls were 2 *pieds* thick. Test excavations and surface indications show that these measurements were correct and that the foundations were 8 inches thicker than the walls.

At those corners where robbing had not occurred there were cut-stone quoins, which are typical of military buildings at Louisbourg. The walls were covered with rough-casting in 1750, traces of which were still attached to the walls when excavated.[19]

The roof of the guardhouse is usually depicted as hipped and was said to be covered with slate in 1751.[20] Earlier, gaps in the slate had been repaired with shingles. A number of slate fragments were found on the floor of the guardhouse during excavation.

The arrangement of doors and windows is only partly known. The collapsed remains of a typical cut-stone doorway surround were found in and around the north wall, with the centre line of the *in situ* sill 6.5 ft. from the northeast corner (Fig. 23). The sill and lower jamb stones indicated a doorway 2 *pieds* wide, and the 2-*pouce* check would take a door of the same thickness. The reconstruction of the doorway shown in Figure 23 has an asymmetrical lintel which is quite atypical of cut-stone doorways at Louisbourg. It seems probable that the excavator has incorporated a lintel stone from another doorway in this one. One of the jamb stones has a square hole cut into the reveal, which could have taken a reinforcement for a bolt housing attached to the outside of the door. Such would be a logical arrangement for an arms-room door, and is the only evidence to suggest that the west room was the arms-room.

A window jamb stone was found on the north wall just to the east of the dividing wall. It had a 2-*pouce* frame check on the inside and a one-*pouce* shutter check on the outside. If the west room was the arms-room, then this window was in the officer's quarters. The doorway, and possibly another window, were probably located in the front wall on the east end of the building.

It is known that the officer's quarters was plastered on the inside to a height of 7 *pieds* 2 *pouces*, which indicates the approximate height of the ceiling.[21] The wooden floor survived in places in a very decomposed state.

In 1749, a brick stove was either installed or repaired, and the following year the masonry chimney stack was repaired.[22] A concentration of rubble and brick around the centre of the dividing wall suggests that the fireplace was situated there.

Historical plans show a porch 6 *pieds* wide and supported on four posts along the front, or east wall of the guardhouse.[23]

Soldiers' Guardhouse

According to historical sources and surface indications, the soldiers' guardhouse was exactly the same over-all size as the officer's; however, its internal dividing wall was placed so as to create a west room 20 *pieds* long for the soldiers, and another along the back 4 *pieds* long for

23 Re-assembled doorway of the armoury of the Queen s Gate guardhouses. The lintel does not properly fit the jambs. A stone from a lintel from another doorway probably has been incorporated accidentally in this re-assembly.

23

a latrine.[24] Excavation was confined to one section cut across the south wall, which revealed a wall 2 ft. thick. This guardhouse was also covered with rough-casting in 1750.[25] The roof was similar to that of the officer's guardhouse, complete with shingle repairs. In 1749 a ceiling was made of Boston boards *à joint recouvert*.[26]

Inside the soldiers' room there was a brick stove, a *lit de camp*, four arms racks, one table and four benches.[27] Mention is also made of an *armoire de consine* which was repaired in 1749.[28]

Along the front or west wall there was a porch shown on plans as being very similar to that on the officer's guardhouse. Surface indications suggest that at the ends of the porch the posts supporting the roof were resting on a masonry sill.

Maurepas Gate Guardhouses

The Maurepas Gate guardhouses were situated, like those at the Queen's Gate, at the foot of the rampart on either side of the gate (Fig. 24). Both guardhouses were completed by 1744, and according to plans and historical documents they were very similar.[29] Although they were almost square, the slightly longer east-west axes were parallel to the roadway. The officer's guardhouse was on the south side and soldiers' on the north. The officer's building was divided into an arms-room and officer's quarters. The soldiers' building was not divided internally, but along the back, or north, wall there was an extension forming a latrine. Along the back of the officer's guardhouse there was a lean-to shed for storing coal.

By 1751, as at the Queen's Gate, the officer did not occupy his quarters, and the arms-room served as a cell.[30] No more is known of these guardhouses until 1767 when they were described as "guardhouses almost in ruins."[31]

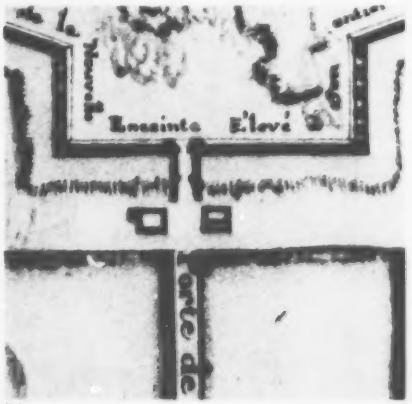
Officer's Guardhouse

Franquet stated that both the officer's and the soldiers' guardhouses were 22 *pieds* 9 *pouces* long by 20 *pieds* 10 *pouces* wide. The officer's room was said to be 18 *pieds* long and the prison 7 *pieds*.[32] Obviously these two sets of figures cannot be consistent. Surface indications are of a building approximately 24 ft. long (very close to 22 *pieds* 9 *pouces*), so it appears that the error is in the sizes of the rooms rather than in the over-all dimensions. Unfortunately, it is not possible to locate accurately the position of the dividing wall, but a pile of rubble and mortar toward the west end may be the remains of it. If so the ratio of length between officer's room and arms-room would have been about 2:1.

Where visible, the remaining walls are about 2 ft. thick. Nothing shows on the surface to indicate quoins, doorways or windows. In an incomplete *toisé* for 1744,[33] no mention is made of cut-stone estimates, yet excavation has revealed cut stones as integral parts of their construction. It seems likely, therefore, that the estimates for cut stone were incorporated in a separate *toisé*.

As with other guardhouses the outsides of the walls were covered with rough-casting in 1750.[34]

24 Historical plan of the Maurepas Gate guardhouses, 1741. The soldiers' quarters with the attached latrines are on the left and the officer's quarters and small armoury are on the right. From a plan entitled "Plan de Louisbourg Ou est Representé en Couleur Jaune les Ouvrages a faire pour perfectionner la Nouvelle Enceinte pendant Lannée 1741." *(Archives Nationales.)*



24

The *toisé* calls for a door to the officer's quarters 6 *pieds* 2 *pouces* high by 2 *pieds* 10 *pouces* wide, made of pine planks 2 *pouces* thick, tenoned into horizontal rails at each end, held in place by a pair of 2-*pied*-long strap hinges fastened by a thumb-latch and secured by a rim-lock.[35] For the prison there was a similar door except that it was only 2 *pieds* 3 *pouces* wide.

All the elements of the roof are mentioned in the *toisé*.[36] However, as is so often the case with these records, it is very difficult and at times impossible to fit the exact quantities given into the known size of the building.

The basic frame of the roof consisted of two trusses, one at each end of a ridge 7 *pieds* 6 *pouces* long, strengthened by king posts and tie-beams, with hip rafters running to each corner of the roof from the king

25 View of the Maurepas Gate guardhouses, 1758. The upper building is the soldiers' quarters and latrines. The lower building is the officer's quarters and armoury. From a view entitled "Plan du Cap breton dit Louisbourg Avec ces environs Pries par Lamiralle Bockoune le 26 juillet 1758." *(Library of Congress.)*

25

posts. All this timber was pine. The ridge, trusses, tie-beams and king posts were of 6 *pouce* by 6 *pouce* wood, and the hip rafters were 4 *pouces* by 8 *pouces.* At least one row of purlins sat on this basic frame to add support to the common rafters. The purlins and common rafters were 4 *pouces* by 4 *pouces* and the wall plate was 4 *pouce* by 8 *pouce* pine. The roof covering consisted of a double layer of Boston boards. By 1750 this had been supplemented by a covering of wooden shingles.[37] The floor of the guardhouse and armoury/cell was supported on joists *(gizans)*[38] of 6 *pouce* by 7 *pouce* pine at a calculated spacing of 4 *pieds.* The floor itself was made of one-*pouce* pine boards. The ceiling for both rooms was supported on joists *(traverses)*[39] of 4 *pouce* by 5 *pouce* pine with a similar spacing. The ceiling boards were similar to the floor boards.[40]

No mention is made of a fireplace or stove for this building since it would have been made of masonry, cut-stone and brick, none of which are mentioned in the *toisé.* However, an enigmatic 1758 view of the guardhouses shows a chimney emerging from a point along the ridge suggesting that there was a fireplace along the dividing wall (Fig. 25). No furnishings were recorded for the officer's room in 1753, because there was no officer there at the time.

Along the front of the guardhouse there was a porch 6 *pieds* wide.[41] According to historical plans it was supported on four posts. The *toisé* states that these posts were made of 9 *pouce* by 9 *pouce* wood. If the total length given for the posts, 35 *pieds,* is divided between four posts, then each one was 8 *pieds* 9 *pouces* high. The posts were anchored top and bottom to a plate and a sill of 10 *pouce* by 12 *pouce* pine. No mention is made of bracing for the posts, but some was undoubtedly used. The roof of the porch is not mentioned, but its rafters and planking may have been incorporated in the specifications for the main roof of the guardhouse. Rafters of 4 *pouce* by 4 *pouce* wood, and one-*pouce*-thick boards, are associated in the *toisé* with the ceiling of the porch.

Along the back of the building there was a lean-to coal shed 21 *pieds* long and 8 *pieds* wide, made of Boston boards over a frame.[42] In the list of building hardware in the *toisé* six pairs of hinges are mentioned, but only five doors are accounted for.[43] One of these six pairs is shorter than the others, only one *pied* 6 *pouces* long. It seems most likely that this anomalous pair belonged on the door of this lean-to shed. The shed does not appear on the 1758 view, and since Franquet said that it was no longer in use in 1753, it may have been removed soon afterward.[44]

Soldiers' Guardhouse

The soldiers' guardhouse differed from the officer's in few respects; the most obvious was the absence of an internal dividing wall, since the whole building was used to house soldiers.

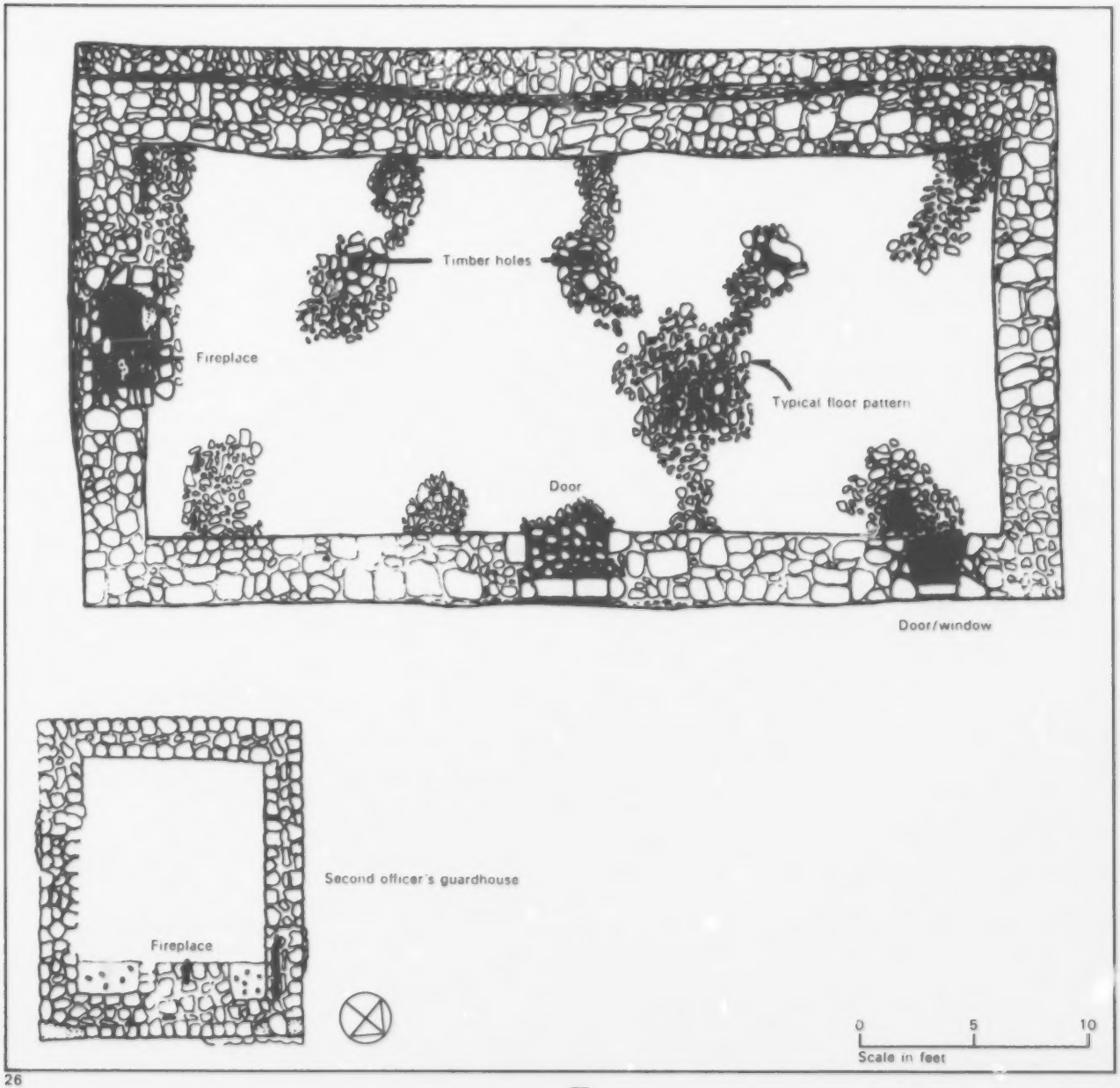
The door was 2 *pouces* wider than that in the officer's guardhouse but was otherwise similar.[45] The 1758 view shows the doorway at the north end of the front wall with two windows to the right of it. (Fig. 25).

The floor of this guardhouse, and possibly also that of the officer's guardhouse, was replaced with one made of Boston boards *à joints recouverts* in 1749. At the same time masonry fill was inserted between the joists.[46]

In the same year a large brick stove was installed and, like those in other guardhouses, it appears to have been removed each spring.[47] The 1758 view shows a projection through the ridge of the roof that was probably a stove-pipe.

Inside the guardhouse was a *lit de camp* 6 *pieds* wide. The foot of this bed was supported on posts of 10 *pouce* by 5 *pouce* wood, and the bed itself consisted of one-*pouce* boards on top of *4 pouce* by 4 *pouce* "rafters."[48] Also in the room were

26 Plan of excavated remains of the Dauphin Demi-bastion barracks/guardhouse.



two arms racks, four benches, a table and an *armoire de consine*. The wall behind this *armoire* was repaired in 1750 with bricks, a common method of repairing masonry walls at Louisbourg.[49]

Along the back of the guardhouse there were latrines approximately 12 *pieds* long by 6 *pieds* wide in exterior dimensions. Internally these were 8 *pieds* by 4 *pieds*. The roof, according to the *toisé*, was hipped at one end with a single truss made of 4 *pouce* by 4 *pouce* wood. Its covering was probably the same Boston boards as were used on the main roof. The floor consisted of one-*pouce* boards. Across the middle of the latrines there was a dividing partition made of one-*pouce* boards 6 *pieds* high, thus creating separate latrines for officer and soldiers. Each had its own door 5 *pieds* 9 *pouces* high by 2 *pieds* 2 *pouces* wide. The account of hardware in the *toisé* makes provision for hinges for these doors, but not for latches or locks. The latrines were made of 2-*pouce*-thick pine planks across the top and down the front. They were one *pied* 9 *pouces* wide and one *pied* 9 *pouces* high.[50] It is interesting that this *toisé* indicates no differences between the latrines for officers and soldiers and, as such, is consistent with several historical plans of other latrines.

Dauphin Demi-Bastion Guardhouses

Two guardhouses, one a converted barracks, were situated on the Dauphin Demi-bastion terreplein. They have been included under the general heading of gateway guardhouses because the evidence suggests that, despite their location, their primary function was control of the Dauphin Gate.

The building next to the powder magazine in the Dauphin Demi-bastion was originally intended to be a barracks for the soldiers manning the guns of the semi-circular battery.[51] Prior to 1745 it was described, with only one exception, as a barracks. Between 1745 and 1749 when the New Englanders occupied the fortress it was used as a prison.[52] From 1749 to 1767 it was exclusively known as a guardhouse.

It is probable, since this building received extensive repairs in 1749, that the French had decided to use it as a replacement for the damaged guardhouses at the Dauphin Gate; however, repairs to these buildings were carried out the following year, which suggests that the plans were changed. In 1751 the barracks/guardhouse was mentioned in a list of guardhouses, but two years later it was noted that it was empty.[53] By 1755-56 the two guardhouses behind the Dauphin Gate were demolished, so it seems probable that the old barracks/guardhouse was refurbished and used for a second time as a guardhouse. At about this time a large reinforcement of troops arrived at Louisbourg where there was a severe shortage of living quarters.[54] It was possibly at this time that the officer's quarters in this building was turned over to soldiers and the small building, found in front of the guardhouse, was built to accommodate the officer. In 1767 both buildings were described as "guardhouses almost in ruins."[55]

Barracks/Guardhouse

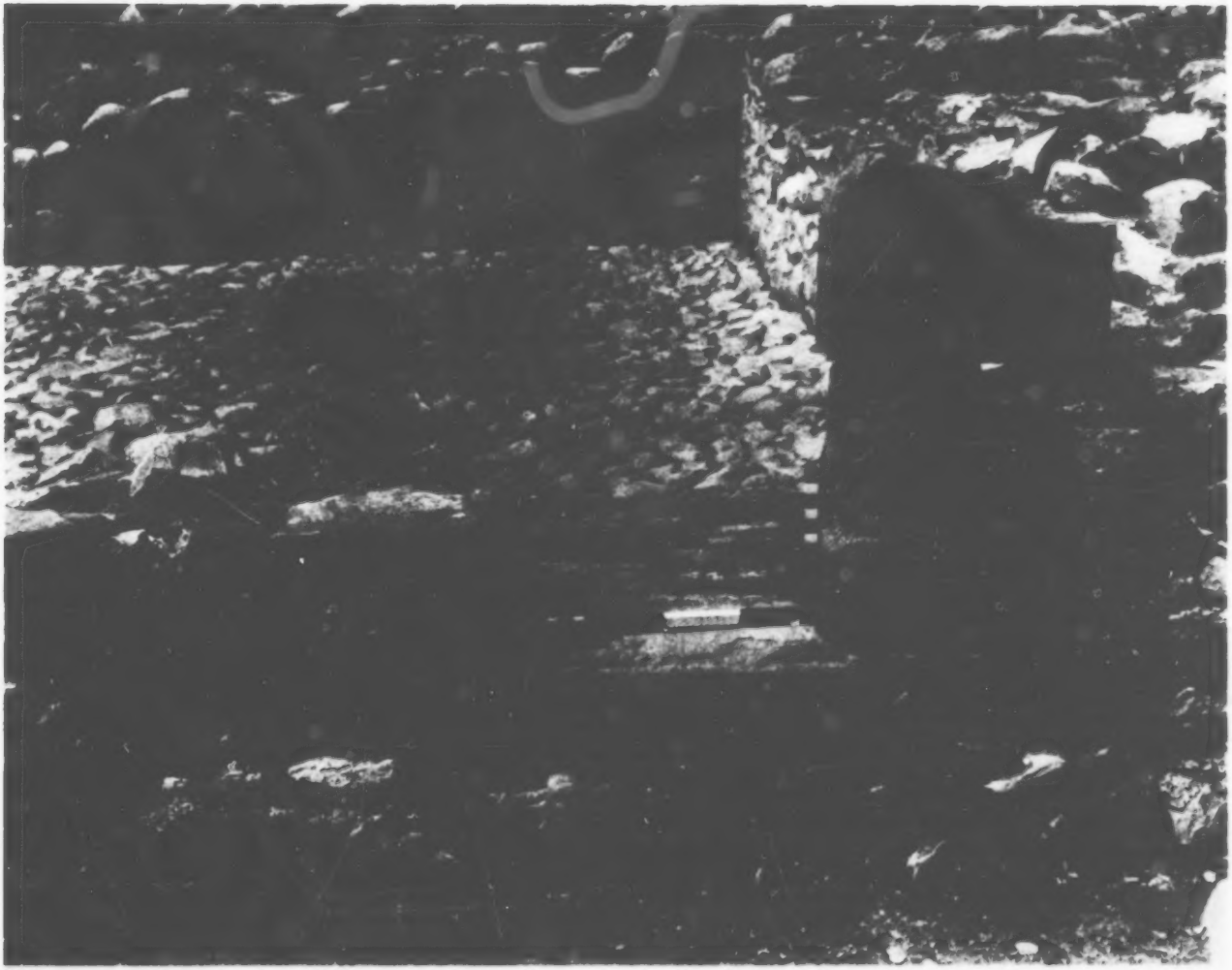
When it first came into use as a guardhouse, the building was "situated in the terreplein of the said Bastion . . . 48 *pieds* long by 25 wide, built in masonry, roofed with shingles and divided into two parts of which the one was for the soldiers, and the other, smaller, for the officer."[56] Excavation revealed a building within 0.5 ft. of the figures for the over-all size, but with no indication of a partition wall separating the two rooms.[57] However, the partition was added after the building was erected and probably consisted of wood supported on a sill resting on the floor; since it would have been removed when the building was renovated to hold extra soldiers there is adequate explanation for its absence. The walls were approximately 3 ft. thick and had dressed sandstone quoins at the two front corners but none at the back, which was hidden below the slope of the rampart of the left face of the bastion (Fig. 26). There was a mass of rock fill immediately against the back of the guardhouse to drain water seepage from the rampart to prevent soaking of the guardhouse wall. As with other guardhouses the walls were covered with roughcasting in 1749.[58]

Approximately 6 ft. from the north corner of the front wall there was an unusual doorway (Fig. 28). The opening would accommodate a door only 2 *pieds* wide, which was unusually narrow. Furthermore the

27 Excavated remains of the Dauphin Demi-bastion barracks/guardhouse.

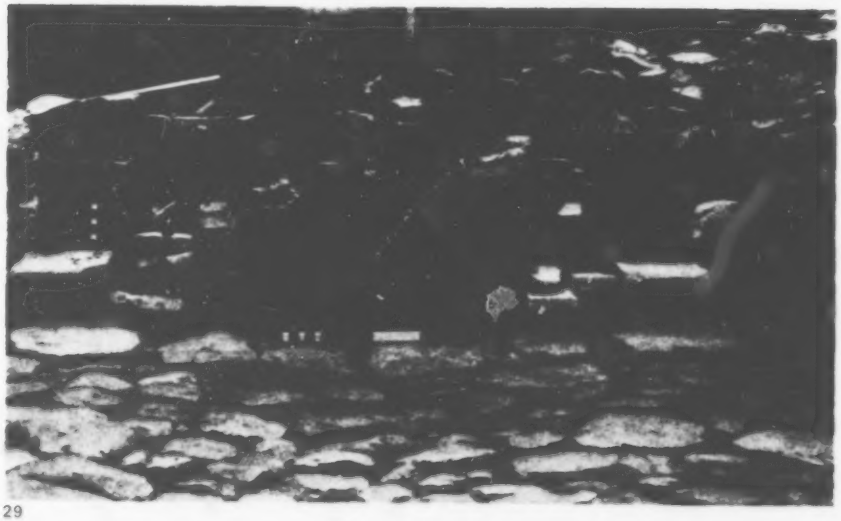
27

28 Doorway/window of the Dauphin Demi-bastion barracks/guardhouse.



28

29 Fireplace in Dauphin Demi-bastion barracks/ guardhouse. The original fireplace with its dressed sandstone jambs and fireback was replaced by a brick stove built within its opening.



29

sill, which consisted of a cut-stone lip at the outer edge with a brick threshold behind, appears to be unique at Louisbourg. The most interesting feature of the door was the presence of a one-*pouce* check on the outside. This, combined with a 2-*pouce* check on the inside, resulted in jamb stones exactly similar in design to those from a window surround. Some plans do show a window in this position, and a repair list of 1749 includes the installation of *"une porte de planches de Baston servant de surtout à celle d. corps de garde* [officer's room]."[59] From the above evidence the most logical interpretation is that a window surround was dismantled and extra stones added to form a doorway. At the same time the shutter check from the original window was used to take a storm door one *pouce* thick.

Historical plans show that there was a doorway centrally placed in the front wall. The remains of the cut-stone surround and sill of this doorway were found when the building was excavated. The opening indicated a doorway originally 3 *pieds* wide, with a door opening inward pivoting on pintles set in the left jamb upon entering.

Historical plans show one window to the left of the central doorway and either one or two to the right, all protected with shutters. No trace of these windows was found during excavation.

The roof was almost always depicted as hipped with a *fleur-de-lis* at each end of the ridge. As noted above it was shingled, and one view shows two dormers in the east side. Since the attic of the building was used to store artillery equipment these dormers may well have existed. None of the roof was found during excavation.

Some plans and views show a large fireplace in the middle of the south wall. The chimney for this fireplace emerged from the wall at eaves level and was free-standing from there to a point level with the ridge of the roof. In 1749 this chimney was masked with planks, presumably because it was suffering from the effects of the Louisbourg climate.[60] At the same time a large brick stove was built in the soldiers' quarters. Excavation revealed that a considerable portion of the fireplace had survived with evidence of later modification (Fig. 29). In its original form the fireplace was constructed of cut-stone. It was 5.3 ft. wide and set 2 ft. into the thickness of the wall. The back had been repaired at various times with brick and the remaining cut-stones were badly cracked. No hearth was found, though this may have been removed. At a later date, probably in 1749, the fireplace was blocked with a brick lining and a crude rectangular brick structure was built within the remaining gap. This had a hearth 3.5 ft. wide, and extended as far as the outer edge of the original jambs. While it is not clear exactly how much a structure functioned, it seems probable that these are the remains of the stove installed in 1749.[61]

Little is known of the furnishings of the guardhouse since it was empty in 1753 when Franquet made his inventory. Early documents mention a *lit de camp*, which is shown on plans running along the west wall.[62]

The cobble floor of the guardhouse had three holes approximately 4.75 ft. from the west wall. The holes were of different sizes and were irregularly spaced; nevertheless they may have taken the uprights of a *lit de camp*, albeit a rather short one. There would also appear to have been an arms rack in the building at some time, and a repair estimate in 1749 indicates *armoires de consines* for both the officer's and soldiers' quarters.[63]

The floor of the building was originally cobbled and was found intact when the building was excavated. However, in 1732 a wooden floor was installed when the building was being temporarily used to store powder while the powder magazine next door was being completed.[64] Presumably this floor must have been removed since no trace of it was found during excavation.

Officer's Guardhouse

The designation of the small building in front of the barracks/guardhouse as an officer's guardhouse is entirely based on supposition. It is nowhere mentioned in any document, nor does it appear, accurately located, on any plan. However, for reasons stated earlier there is some justification for believing that it did indeed serve to house an officer. The building was 16.25 ft. east-west by 13.75 ft. north-south with walls 2 ft. thick and cut-stone quoins *in situ* on the northeast and southeast corners, and others lying nearby for the northwest and southwest corners (Fig. 26). A rubble-stone base for a fireplace or stove was situated in the middle of the east wall. Apart from these few facts, nothing is known of the nature of the building.

Town Guardhouses

There were two guardhouses that fall into the category of town guard posts, one on the townside Place d'Armes of the King's Bastion and one at the west end of the Pièce de la Grave.

Place d'Armes Guardhouse

The first town guard post was situated on the Place d'Armes on the right as one approached the bridge to the central passageway of the barracks (Fig. 30, *a*). It was built in 1740 to replace the passageway guardrooms. Franquet described the guardhouse as "constructed in masonry 34 *pieds* 4 *pouces* long by 20 *pieds* 3 *pouces* wide, . . . and divided into two parts of which one 9 *pieds* 6 *pouces* serves the officer and the other of 20 *pieds* [serves] the soldiers."[1]

Excavation revealed little beyond the foundations of the building and its dividing wall, but did show that Franquet's measurements were accurate (Fig. 31). The masonry walls varied between 1.5 ft. and 2.0 ft. thick.[2] The outside surface of parts of the walls was covered with rough-casting in 1750. The position of the partition wall showed that the smaller officer's quarters was on the right when facing the front of the building, and the soldiers' on the left.

The 1758 view shows a doorway at each end of the front, or south, wall and two windows equidistantly spaced, one for each room (Fig. 30, *b*). In addition there was another window in the east wall of the officer's room.

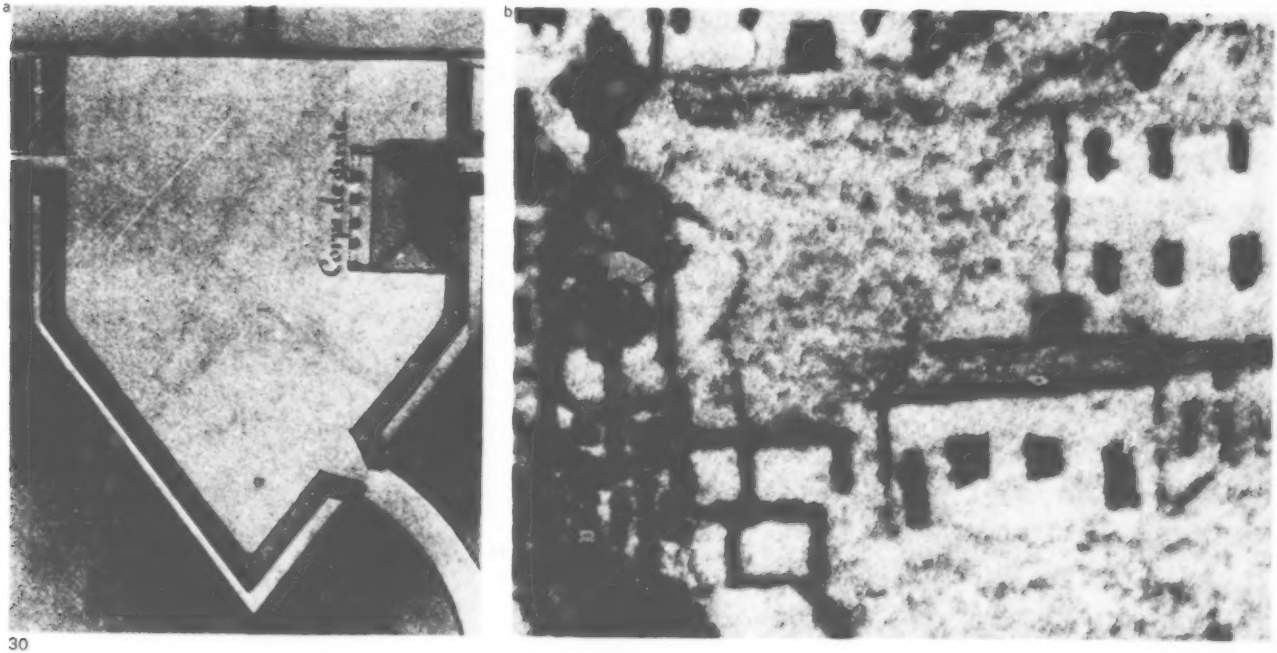
In 1749 the officer's doorway was furnished with an extra storm door made of Boston boards, tongued and grooved and strengthened with battens.[3] The roof of the guardhouse was hipped and covered with shingles.[4]

Inside, the officer's quarters was whitewashed in 1749.[5] Other officers' guardhouse quarters would indicate the whitewash was probably applied on a plastered surface rather than directly on the stones. The floor of both rooms was replaced in 1750 with a double floor of Boston boards.[6] The officer's room contained a fireplace set in the dividing wall. All that remained of it when excavated were two masonry pillars set 2.5 ft. apart on which the hearth was supported. The mantlepiece and chimney-breast of this fireplace was repaired in 1749. At the same time a stove was installed.[7]

The room was furnished with a table with a drawer, an armchair, a straw chair and a half-sized *armoire*.[8] Since no bed is mentioned in the 1753 list of furnishings, the officer may have slept in the nearby barracks. An *armoire de consine* was installed complete with shelves in 1749.[9]

As far as is known, the soldiers' quarters was not plastered nor did it have a fireplace. Instead there was a large brick stove which was removed in summer.[10] Other furnishings in the room included a *lit de camp*, a table, two benches, three

30 Historical plan and view of the Place d'Armes guardhouse. *a*, 1752, from a plan entitled "Plan du Bastion du Roy cotté 3, nommé communement le fort, pour servir au Projet de l'aggrandisement de la Place d'Armes" *(Archives du Génie)*; *b*, 1758, from a view entitled "Plan du Cap breton dit Louisbourg Avec ces environs Pries par Lamiralle Bockoune le 26 juillet 1758" *(Library of Congress)*.



30

arms racks and a fixed *armoire*.[11] This room also had an *armoire de consine*.

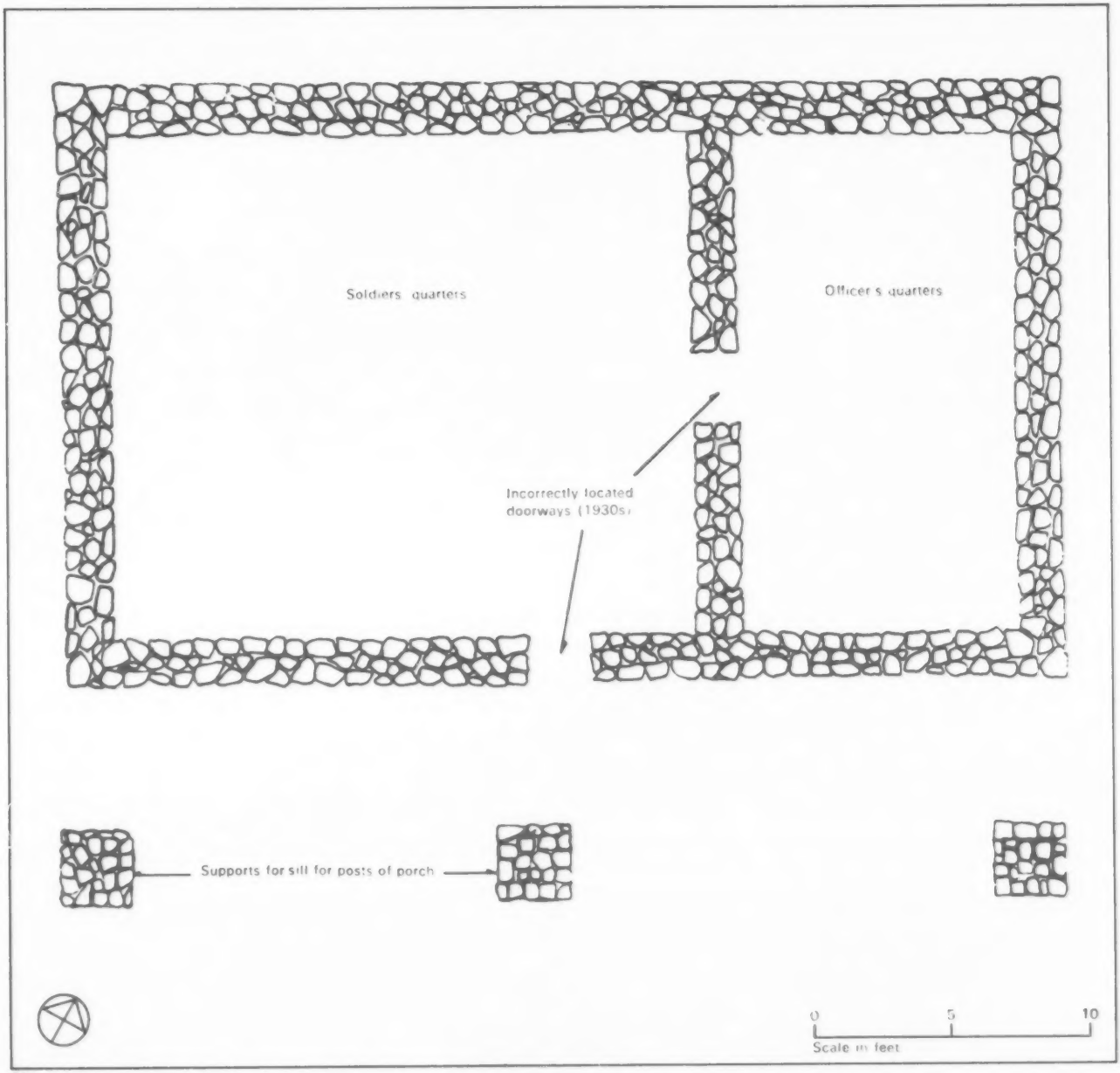
Along the front of the guardhouse there was a porch 6 *pieds* wide. This is often shown on historical plans with six posts supporting it, which would be in accord with post spacing on other porches. All that survived of this porch when excavated were three masonry pillars below grade, approximately 6 ft. from the front wall, which may have been the seating for a sill supporting the posts. Before excavation there was a shallow depression occupying the area of the porch. Records of restoration in 1935 note that cobbling was being restored somewhere on this Place d'Armes, and since the floor of the porch is the area that would have reason to be cobbled we may assume that these records were referring to this feature. Nothing of it was found during excavation so presumably the restoration got no farther than removing the stones.

Pièce de la Grave Guardhouse

The second town guard post was situated at the foot of the rampart at the west end of the Pièce de la Grave. It apparently was not completed until 1744 when a *toisé* for certain parts of this and the Maurepas Gate guardhouse was drawn up.[12] Unfortunately no large-scale plans of it survive and little is said of the guardhouse until 1767, when it was described as "almost in ruins."

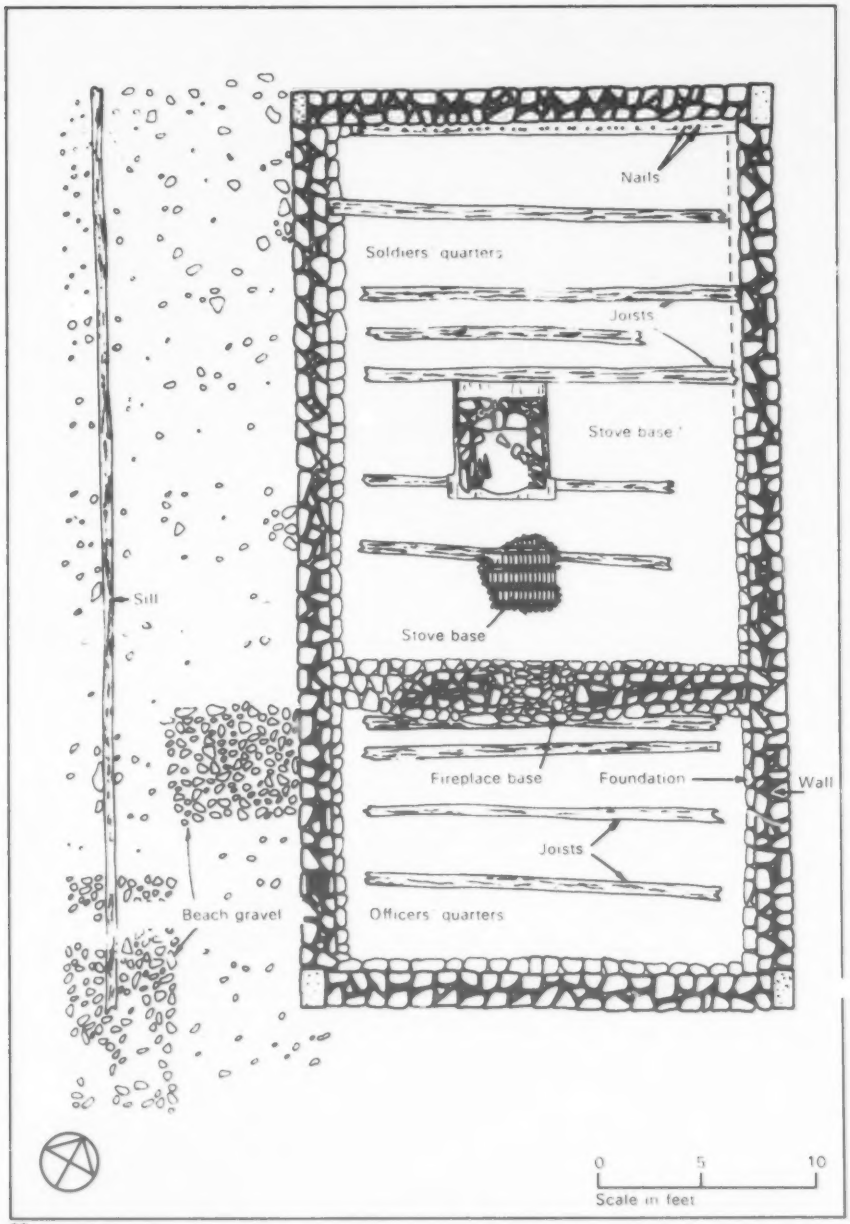
In 1751, Franquet stated that the guardhouse was a masonry building 42 *pieds* long by 22 *pieds* wide, divided internally into a room 12 *pieds* long for the officer, and a room 24 *pieds* 10 *pouces* long for the soldiers.[13] Excavated remains revealed almost exactly the same dimensions (Fig. 32). All the walls were approximately 2 ft. thick and sat on foundations 2.5 ft. wide with the ledge on the inside. Around the outside of the

31 Excavated remains of the Place d'Armes guard-house.



31

32 Plan of excavated remains of the Pièce de la Grave guardhouse.

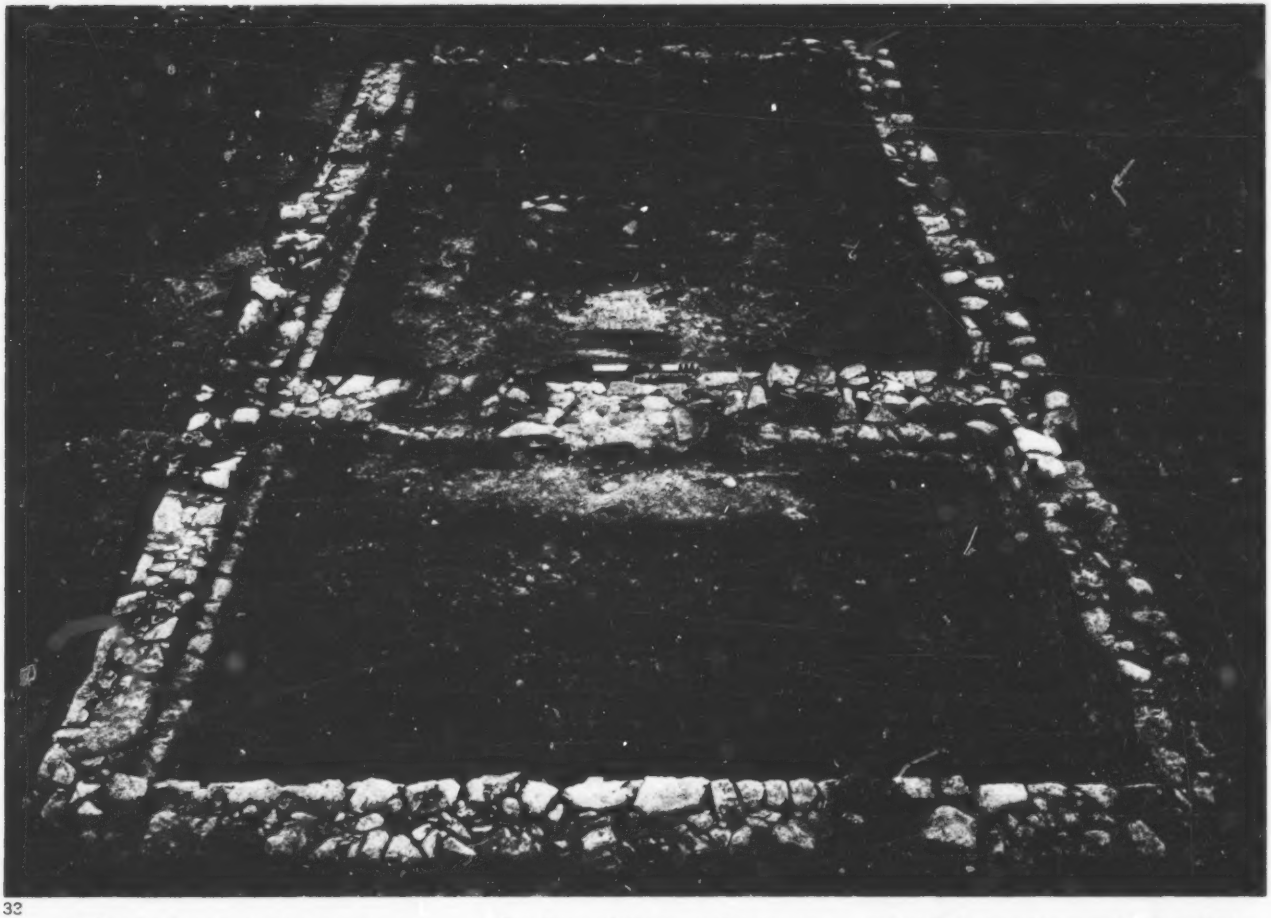


32

walls the construction trench dug through the gravel beach could be readily observed. As with other guardhouses the walls were covered with rough-casting in 1750.[14] All four corners of the building had cut-stone quoins in various stages of decay (Fig. 34).

Nowhere is the arrangement of doors and windows mentioned, but most logically the doors and some of the windows would have been in the front or southwest wall. By analogy with the similar guardhouse in the Place d'Armes, the doors were probably at each end with three windows between them and a fourth in the southeast wall of the officer's room. The *toisé* describes the doors as made of 2-*pouce*-thick vertical pine planks tenoned into horizontal rails 6 *pieds* 3 *pouces* high by 2 *pieds* 9 *pouces* wide. They were held in place with 2-*pied*-long strap-hinges and secured with rim-locks.[15] In 1749 an outer storm door was added to the officer's doorway similar to the one on the Place d'Armes guardhouse.[16] Specifications were also given for four oak window *chassis* 4 *pieds* high by 3 *pieds* 3 *pouces* wide. The *chassis* were held in place by jamb anchors, two on each side. The windows themselves were double-leaf pivoting on *fiche à vase* hinges, two on each side, and containing glass panes 7 *pouces* by 8 *pouces*. They were held shut with two spring bolts. Lead listed in the *toisé* for flashing around a dormer is the only evidence for such a feature in this building.[17]

33 Excavated remains of the Pièce de la Grave guardhouse.



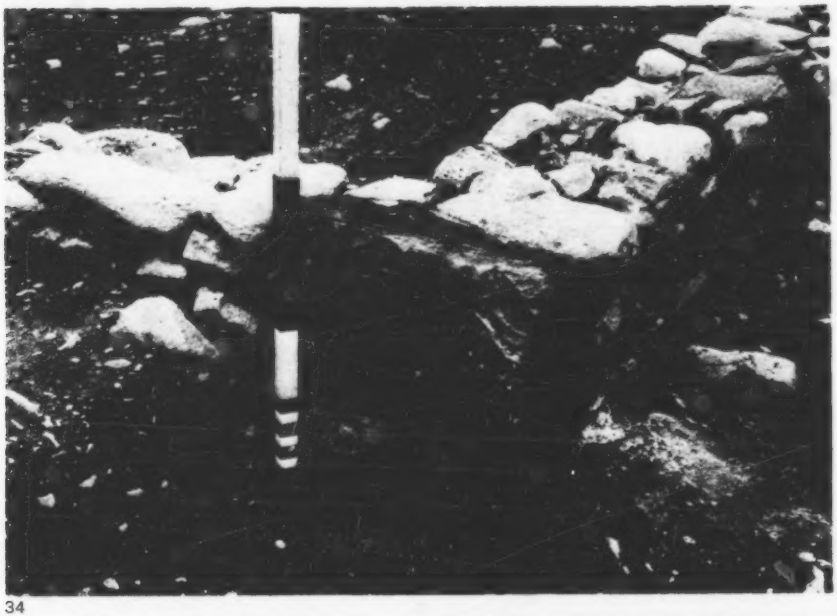
32

Unfortunately the *toisé* does not deal with the roof of the guardhouse. All that is known is that it was hipped and covered with shingles, and had furring at the eaves.[18]

The floor of the guardhouse was said to be supported on pine joists 6 *pouces* by 7 *pouces*.[19] The 190 *pieds* of wood mentioned in the *toisé* would allow for approximately 4-*pied* spacing between joists. During excavation the remains of 11 joists, unequally spaced, were found. The remains of the wood plus the distance between the surviving surface and the nail heads, less the thickness of the floor planks, indicated that the joists were originally very close to the dimensions given in the *toisé*. The irregular spacing of the joists appear to have included later repairs and framing around stove and fireplace, while the basic unit of spacing was approximately 4 ft., as the *toisé* figures had indicated. The joists were

34 Quoin stones of the Pièce de la Grave guardhouse.

35 Mortar with impressions of edge-set bricks of a stove base in the soldiers' quarters of the Pièce de la Grave guardhouse.



34

35

supported at either end on the ledge of the footer, except for the joist at the northwest end of the building which was supported along its whole length on the ledge. In between the ledges the joists rested directly on the gravel on which the guardhouse had been built.

The floor and ceiling were said to be made of one-*pouce* pine planks.[20] During excavation badly decomposed traces of the floor planking were found immediately below the destruction layer. Along the north joist there was an almost complete nailing pattern for the planking. Although there were some irregularities, many of the nails were grouped in pairs 0.5 ft. and 0.42 ft. apart, indicating a floor made of random-width planks averaging 0.92 ft. wide.

The *toisé* describes the brick hearth of the fireplace in the officer's quarters as 4 *pieds* wide, 4 *pieds* long and 4 *pouces* thick, indicating that the bricks (normally, at Louisbourg 8 *pouces* by 4 *pouces* by 2 *pouces*) were set on edge.[21] Excavation revealed a gap 4.5 ft. wide in the middle of the dividing wall. As it survived, the gap went completely through the wall, but originally it would have had either a brick or cut-stone fireback. None of the hearth bricks was found but a gap in the joists in front of the fireplace indicated that it projected out into the room, and the position of the next joist 2 ft. away from the wall would have defined the extent of this projection. This is one of the few fire-

places that is not recorded as having been replaced by a stove in 1749.

In the soldiers' quarters there was apparently a stove from the beginning. Nothing is known of the original stove which was replaced by one built of brick in 1749. This was repaired in the same year and an estimate was made for constructing another of the same material.[22] Excavation revealed a spread of mortar with brick impressions in its surface about 3 ft. from the dividing wall, opposite the officer's fireplace (Fig. 35). The boundaries of the mortar were irregular but over-all it measured 4 ft. by 3.5 ft. The impressions showed that the bricks were laid on edge in four rows with stretcher courses between the rows. The most likely interpretation of this mortar is as part of a stove base. Its position would allow it to share the chimney with the officer's fireplace.

What may have been the base of the original stove was found 2.5 ft. from the mortar toward the centre of the room. This consisted of a stone-lined depression open on the southeast side, with joist framing around it. Over-all, it was 5.2 ft. by 4.2 ft. with a northwest stone lining 1.5 ft. thick and thinner walls flanking it. The framing around it is evidence of the common practice of placing a temporary floor over the site of the stove in summer. If this was the base for a stove it must have been the first one, since all known later ones are said to have been of brick.

The walls of the officer's quarters were covered with a mixture of sand and lime to a height of 7 *pieds* 9 *pouces*.[23] Fragments of this plaster were found along the base of the dividing wall. Impressions of wood grain on the back showed that the plaster had been applied over lathing.

In 1753 the officer's quarters contained a *lit de camp*, a table, a chair and an armchair.[24] The *lits de camp* of this and the soldiers' quarters were 7 *pieds* wide and made with a framing and feet of 10 *pouce* by 5 *pouce* pine, rafters of 4 *pouce* by 4 *pouce* pine, and boards of one-*pouce* pine.[25]

The soldiers' quarters contained a *lit de camp*, a table, five benches, five arms racks and an *armoire de consine*.[26]

Along the front of the guardhouse there was a porch 9 *pieds* wide. The *toisé* describes the rafters of the ceiling of the porch as 4 *pouce* by 4 *pouce* pine, and the ceiling itself as made of one-*pouce* pine boards. A masonry fill was placed under the furring of the porch.[27] All that remained of the porch when excavated was a line of decomposed wood, the remains of the sill, immediately below the surface, parallel to the front of the guardhouse and 9.5 ft. from it. Beneath the sill for half its length there was a course of flat stones providing a firm base for the sill. The floor of the porch consisted of a loose spread of gravel thrown over a grading layer of clay that stretched around the whole guardhouse.

Along the back of the guardhouse there was a lean-to shed 8 *pieds* wide made of Boston boards that was used to store coal. In 1753 Franquet stated that this was no longer in use since the soldiers were by then using wood for firing the stove.[28] Excavation revealed little trace of this shed. All that could be seen were slight traces of burning and some ash. Probably the shed was removed before the guardhouse was abandoned, as seems to be the case with the shed at the Maurepas Gate.

English Guardhouse

During the period of English occupation between 1758-68 a guardhouse was built at the northwest corner of Block 3, near the quay. It is marked on plans as a "mainguard."[29] Nothing more is known of this guardhouse.

Part I
Guardhouses: Their Construction and Use

1 France. Archives Nationales. Section Outre-Mer, Dépôt des Fortifications des Colonies (hereafter cited as AN, Section Outre-Mer, DFC). Order No. 201, "Toisé Provisionnel des Ouvrages que le Sr. Bernard Muiron Entrepreneur a fait pour les fortifications de la Ville de Louisbourg pendant la presente année 1744", 30 October 1744.

2 France. Archives Nationales. Colonies (hereafter cited as AN, Col.). C^{11}B, Vol. 33, fol. 230, "Etat General des Pavillons, Cazernes, Corps de Garde, Magazins a poudre, et de tous Autres Batiments que ceux affectés aux Vivres de cette Place," 9 October 1753.

3 Boston (or Baston) boards were pre-cut lumber from New England colonies. Since they are almost always called boards (*planches*) they were probably one inch thick, translated to one *pouce* thickness by the French.

4 The modern term is *coyau*.

5 This type of construction was described in the documents as *avec emboitures*.

6 The modern spelling is *serrure bénarde*.

7 France, Bibliothèque du Génie, MS 131d, "Du Second Livre des Fortifications du Sieur Masse . . ." (based on a treatise written in 1728).

8 AN, Col., C^{11}B, Vol. 28, fols. 330-51, "Etat des Ouvrages de reparations Et fournitures qui ont esté faittes dans tous les bastiments du Roy a Louisbourg . . . . par Le Sr. Claude Coeuret Entrepreneur En Consequence de l'ordre qu'il en a reçu de Monsieur Prevot Commissaire ordonnateur En cette Isle le 23^{e} Juillet 1749," 31 December 1749.

9 *Ordonnance du Roy Concernant les Gouverneurs et Lieutenant Gouverneurs des Provinces . . . du 25 juin 1750* (hereafter cited as *Ordonnance*) (Arras: Duchamp, 1750), p. 46.

10 Blaine Adams, "Construction and Occupation of the Barracks of the King's Bastion." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1971, n.p.

11 AN, Col., C^{11}B, Vol. 33, fols. 229-34, "Etat . . . ," 9 October 1753.

12 *Consine* and *Consin* are the two spellings used in documents relating to Louisbourg. The modern spelling is *consigne*.

13 *Ordonnance*, loc. cit.

14 AN, Section Outre-Mer, DFC, G^{2}, (Conseil Supérieur, Louisbourg), Vol. 183, fols. 81-81(v), "Procedure Criminel . . . de Jean dit Landruy soldat . . . ," July 1734.

15 AN, Col., C^{11}B, Vol. 35, fol. 206(v), Franquet to the Minister, 11 November 1755.

16 France. Laws, statutes, etc., *Code militaire; ou Compilation des ordonnances des roys de France concernant les gens de guerre, par De Briquet* (hereafter cited as *Code Militaire*) (Paris: Imprimerie royale, 1728), Vol. 1, pp. 279-94.

17 AN, Col., C^{11}B, Vol. 18, fol. 181, "Etat de la Depense des menus ouvrages extraordinaires que le S. Ganet a fait et fourny pour l'entretien des Batiments appartenants au Roy dans la ville et Port de Louisbourg pendant les années suivants," 11 May 1736.

18 Ibid., Vol. 17, fol. 181, "Estat de la Depense necessaire pour Le Chauffage et Le Luminaire des Corps de garde de Louisbourg pendant Lannée," 10 February 1735.

19 Blaine Adams, op. cit., n.p.

20 AN, Col., C^{11}B, Vol. 29, fol. 282, "Etat des Ouvrages de reparations Et entretiens qui ont Etés faits dans tous Les Batiments du Roy a Louisbourg . . . . Par le Sr. Claude Coeuret Entrepreneur, En Consequence de Son Marché passe a Louisbourg Le 15^{e} août 1750," 31 December 1750.

21 *Code militaire*, op. cit., p. 286.

22 AN, Col., C^{11}B, Vol. 32, fol. 186, "Etat des vivres, munitions et marchandises necessaires pour la subsistance et l'habillement des troupes de la garnison de L'Isle Royale. Subsistance des habitants de L'acadie refugiés en la ditte Isle et a L'Isle St. Jean, pour garnir les Magazins du Roy, pour les Besoins du Service et des Batteries de Louisbourg pendant l'année mil Sept cens cinquante trois," 25 October 1752.

23 Ibid., Vol. 27, fol. 207, "Etat des Vivres munitions et Marchandises nécéssaires pour la Subsistance et l'habillement des Troupes et La garnison de l'Isle Royale. Subsistance des habitans refugies de l'Accadie et Etablis sur la ditte Isle, et Sur L'isle St. Jean pour garnis les magazins du Roy pour les differns besoins du service et sa Majesté et pour les Batteries de Louisbourg pendant l'année Mil sept cens cinquante Sept.," 29 November 1756.

24 Ibid.

25 *Encyclopédie; ou Dictionnaire raisonné des sciences, des arts et des métiers, par une société de gens de lettres* (Paris: Briasson, 1751-65), Vol. 3, p. 302.

26 AN, Col., C^{11}B, Vol. 28, fol. 217, "Balance des Recettes et Concomm [?ation] des Vivres Munitions, et Marchandises faittes dans des Magasins du Roy a Louisbourg depuis le Vingt troisieme Juillet Jusques et compris le dernier decembre mil sept cent quarante neuf," 31 December 1750, cited in Yvette Thériault, "Occupation-Destination-Ameublement du Château St. Louis." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1966, Vol. 5, p. 5.

27 *Ordonnance*, p. 85.

28 AN, Col., C^{11}B, Vol. 32, "Etat . . . ," 25 October 1752.

29 *Code militaire*, loc. cit.; *Ordonnance*, loc. cit.

30 *Histoire générale de la marine, contenant son origine chez tous les peuples du monde, ses progrés, son état actuel et les expeditions maritimes anciennes et modernes* . . . (Paris: A. Baudet, P. Prault, 1744-58), 3 vols., n.p.

31 Ibid.

32 AN, Col., C^{11}B, Vol. 23, fol. 71, DuQuesnel to the Minister, 19 October 1741.

33 *Ordonnance*, p. 63.

34 AN, Col., C^{11}B, Vol. 35, fol. 108, Drucour to the Minister, 10 November 1755.

35 Ibid., Vol. 28, fols. 330-51, "Etat . . . ," 31 December 1749.

Part II. Gazetteer of Louisbourg Guardhouses

Barracks Guardrooms

1 AN, Col., C^{11}B, Vol. 9, fol. 155, "Toisé des ouvrages de Maçonnerie, de terre, pierre de taille, charpente, serrurerie etc. que le Sr. francois Ganet a fait au corps de Cazernes du Bastion du Roy et Pavillon des d. Cazernes a Louisbourg aprés le deceds du feu Sr. Isabeau cy devent entrepreneur des d. ouvrages et ce depuis le vingtroisieme may XVII^{C} vingt cinq Jusqu'au trentieme avril XVII^{C} vingt sept aux prix et conditions portées par le marché passé avec le d. Sr. Isabeau 13 Neuf mars XVII^{C} dix neuf et En corformitté du Marché passé avec le d. Sieur Ganet le vingt quatrieme fevrier XVII^{C} vingt cinq," 4 May 1727; Jeremy B. Akerman, "Château St. Louis Central Passageway Research Report," Manuscript on file, National Historic Parks and Sites, 1966, Fig. 4.

2 France. Archives du Génie (hereafter cited as AG), Art. 14, Louisbourg, "tablette" No. 8, "Le Bastion Du Roy Superieur aux Autres Bastion De La Ville de Louisbourg," ca. 1731.

3 AN, Col., C^{11}B, Vol. 23, fol. 201, "Estat des fonds necessaires pour la dépense des Ouvrages des fortifications de Louisbourg pendant l'année 1741," 27 October 1740.

4 Ibid., Vol. 9, fol. 168, "Toisé . . . ," 4 May 1727; ibid., fol. 160(v); ibid., fol. 167; ibid., fol. 171(v).

5 Ibid., fol. 160.

6 Iain C. Walker, "Archaeological Report on the North Half of the Château," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1964, p. 63.

7 AN, Col., C^{11}B, Vol. 17, fols. 160-7, "Estat . . . ," 10 February 1735.

8 Ibid., Vol. 9, fol. 155(v), "Toisé . . . ," 4 May 1727; ibid., fol. 156.

9 Iain C. Walker, op. cit., pp. i-vi.

10 AN, Col., C^{11}B, Vol. 9, fol. 173(v), "Toisé . . . ," 4 May 1727.

11 Ibid., fols. 166(v), 174.

12 AG, Art. 14, Louisbourg, "tablette" No. 8, "Le Bastion Du Roy Superieur aux Autres Bastion de La Ville de Louisbourg," ca. 1731.

13 AN, Col., C^{11}B, Vol. 9, fol. 167, "Toisé . . . ," 4 May 1727; ibid., fol. 162(v).

14 Ibid., fols. 164, 169.

15 Ibid., Vol. 18, fol. 181, "Estat . . . ," 11 May 1736.

16 Ibid., fols. 181-192.

17 Ibid., Vol. 12, fol. 145, "Toisé des Ouvrages qui ont été faits aux Cazernes, Bastion du Roy, vieux hopital et vieux Gouvernement etc. par feu le Sr. Michel Philippe Isabeau Entrepreneur des fortifications de Louisbourg et par les heritiers. Les Prix desquels ouvrages n'ont pas Eté compris dans le marchez du d. feu Isabeau passé à Paris de 7^{e} mars 1719," 1 September 1731.

18 Ibid., Vol. 6, fol. 304, "Dévis d'Une grande Baterie de Canons que Le Roy a ordonné de faire Executer au Nord du Port de Louisbourg tant en terres, maçonnerie Pierre de taille, charpente, Couverture, menuiserie, gros menus fers, vitres, Plomb, plantage de Palisades et autres natures d'ouvrages qui si viennant dans le detail du travail lesquels seront faits suivant la forme du present devis." 8 August 1723; ibid., fol. 307(v).
19 Ibid., Vol. 18, fol. 307(v), "Etat de ce qu'il faut faire a la Batterie Royalle au Port de Louisbourg, soit pour la parachever ou en remplacement suivant la visitte qui en a Eté faite Ce jourd huy 13^{e} Septembre 1736," 13 September 1736.
20 Ibid., Vol. 6, fol. 307(v), "Devis . . . ," 8 August 1723.
21 Ibid., fol. 306.
22 Ibid., fol. 306.
23 Ibid., fol. 307(v).
24 Ibid., fol. 304(v).
25 Ibid., Vol. 18, fol. 307(v), "Etat . . . ," 13 September 1736.

Barracks Guardhouses

1 Claude Poulin, "Anciennes Casernes," in John Fortier, "King's Bastion Report VIII, A Survey of the Terrain of the Citadel Area Prepared for the Purpose of Archaeological Excavation," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1965, App. 5, p. 8.
2 AN, Col., C^{11}B, Vol. 12, fol. 124(v), "Toisé general et difinitif de tous les ouvrages de terres Maçonnerie, Pierre de taille, Charpente, Menuiserie, Couverture &c. qui ont Eté faits au Bastion du Roy, Cazernes, hopital, Magazin et Angar, Et des Reparations qui avoient Eté faits au Vieux hopital, Vieilles Cazernes, et Vieux logement des officers et du Gouvrnement par le feu Sr. Michael Philippe Isabeau Entrepreneur des fortiffications de Louisbourg depuis L'Année 1719 jusqu'en 1724. En Consequence de Son marché passé a Paris le 7^{e} mars 1719 et des Ouvrages qui ont Eté faits aprés son decès par les heritiers chargez de procuration jusqu'en 1730 non Compris Ceux que le Sr. Gannet a faits aux dites Cazernes portez par un toisé particulier," 6 September 1731.
3 Ibid., Vol. 3, fol. 120(v), "Etats des fonds ordonnez pour les Fortifications de L'Isle Royalle et des depenses faites pendant l'Année 1718," 31 December 1718.
4 Ibid.
5 Both *plans de bois* and *plans de terre* are terms of uncertain meaning. The most likely interpretation, based on internal evidence from documents concerned with Louisbourg buildings, is that *plans de bois* refers to bark (if *plans* is a corruption of *pelans*), and that *plans de terre* refers to sod. Another possibility is that *plans de bois* refers to the four outer pieces of wood removed during the squaring of a log.
6 AN, Col., C^{11}B, Vol. 3, fol. 120(v), "Etat . . . ," 31 December 1718.
7 Ibid., fol. 121.
8 Ibid.
9 Christian Pouyez, "Rapport préliminaire Sur Les Combles et Couvertures," in Historians, "Preliminary Architectural Studies," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1971, Vol. 2, p. 23, Table 8.
10 AN, Col., C^{11}B, Vol. 3, fol. 121, "Etat . . . ," 31 December 1718.
11 Ibid.
12 Ibid.
13 Ibid.
14 Ibid.
15 Ibid.
16 AN, Section Outre-Mer, DFC, Order No. 200, "Toisé Provisionnel des Ouvrages qui ont été faits a l'Isle de l'Entrée du Port, Pour l'Etablissmt. d'une Boulangerie, d'un corps de garde pour les soldats, d'une prison et de deux plattes formes de mortiers; par le Sr. Muiron Entrepreneur des fortiffications de Louisbourg pendant la presente année 1744," 30 October 1744.
17 AN, Col., C^{11}B, Vol. 28, fol. 351, "Etat . . . ," 31 December 1749.
18 Ibid., Vol. 35, fol. 108, Duhaget to the Minister, 29 October 1755.
19 Ibid., fols. 32-34(v), Drucour and Prévost to the Minister, 19 June 1755.
20 AG, Art. 14, Louisbourg, "tablette" No. 19, "Plan de la Ville de Louisbourg En L'Isle Royale," 1758.
21 AN, Col., C^{11}B, Vol. 28, fol. 337(v), "Etat . . . ," 31 December 1749.
22 Ibid., fol. 338.

Gateway Guardhouses

1 AN, Col., C^{11}B, Vol. 10, fol. 242(v), Verrier to the Minister, 18 December 1729, cited in Margaret Fortier, "Dauphin Bastion," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1966, p. 99.
2 Bruce W. Fry and Charles S. Lindsay, "Excavation of the Dauphin Demi-bastion, 1966-67," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1969, Historical Introduction, n.p.
3 AN, Col., C^{11}A, Vol. 126, fol. 122, "Louisbourg 1756. Plan du front d'entre les Bastions du Roy cotté 3, celuy de Dauphin cotté 4, et la Mer," 1756.
4 AG, Art. 14, No. 1, pièce 28, "Etat Des Pavillons, Cazernes, Corps de Garde, Magazins a Poudre, Logements Particulier, et de tous autres Bâtiments, que Ceux affectés aux Vivres de Cette Place," 1751.
5 AN, Col., C^{11}B, Vol. 29, fol. 288, "Etat . . . ," 31 December 1750.
6 Ibid.
7 Ibid., Vol. 33, fol. 229(v), "Etat . . . ," 9 October 1753.
8 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1750.
9 Ibid.
10 AN, Section Outre-Mer, DFC, Order No. 227, "Louisbourg 1751. Plan du front de fortification d'entre le Bastion du Roy Cotté 3 celuy de Dauphin cotté 4 et la Tenaille de la Porte Dauphin," 1751.
11 AN, Col., C^{11}B, Vol. 29, fol. 288, "Etat . . . ," 31 December 1750.
12 Ibid.
13 Ibid., Vol. 33, fol. 229(v), "Etat . . . ," 9 October 1753.
14 Ibid., Vol. 20, fol. 228, Verrier to the Minister, 1 November 1738.
15 Ibid., Vol. 28, fol. 349(v), "Etat . . . ," 31 December 1749.
16 Ibid., Vol. 33, fol. 229(v), "Etat . . . ," 9 October 1753.
17 J. Russell Tarper, "The Fortress of Louisbourg: A report of Preliminary Archaeological Investigations . . ." Manuscript on file, National Historic Parks and Sites, Louisbourg, n.d., Vol. 2, pp. 274-96.
18 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
19 AN, Col., C^{11}B, Vol. 29, fol. 287, "Etat . . . ," 31 December 1750.
20 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
21 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 December 1744.
22 AN, Col., C^{11}B, Vol. 28, fol. 349(v), "Etat . . . ," 31 December 1749; ibid., Vol. 29, fol. 287, "Etat . . . ," 31 December 1750.
23 AN, Section Outre-Mer, DFC, Order No. 232, "Plan de l'etat actuel des fortifications de Louisbourg dans le front du mur crenelé et dans celuy compris entre l'angle flanque du bastion Princesse et l'angle flanque du bastion de la Reine," 1754.
24 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
25 AN, Col., C^{11}B, Vol. 29, fol. 287, "Etat . . . ," 31 December 1750.
26 Ibid., Vol. 28, fol. 349(v), "Etat . . . ," 31 December 1750.
27 Ibid., Vol. 33, fol. 229, "Etat . . . ," 9 October 1753.
28 Ibid., Vol. 28, fol. 349(v), "Etat . . . ," 31 December 1749.
29 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
30 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
31 Canada, Public Archives (hereafter cited as PAC), Map Division, H240, "A Plan of Louisbourg Survey'd and drawn for his Excellency The Honble Major General Thos. Gage Commander in Chief of His Majesty's Forces in America," 1767.
32 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
33 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
34 AN, Col., C^{11}B, Vol. 29, fol. 287(v), "Etat . . . ," 31 December 1750.
35 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
36 Ibid.
37 AN, Col., C^{11}B, Vol. 29, fol. 287, "Etat . . . ," 31 December 1750.
38 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
39 Although *traverses* has a different meaning today and in France in the 18th century, in documents concerned with Louisbourg buildings it quite clearly refers to ceiling joists.
40 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
41 Ibid.
42 AN, Col., C^{11}B, Vol. 33, fol. 230(v), "Etat . . . ," 9 October 1753; ibid., Vol. 28, fol. 349, "Etat . . . ," 31 December 1749.

43 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
44 AN, Col., C^{11}B, Vol. 33, fol. 230(v), "Etat . . . ," 9 October 1753.
45 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
46 AN, Col., C^{11}B, Vol. 28, fol. 239(v), "Etat . . . ," 31 December 1749.
47 Ibid.
48 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
49 AN, Col., C^{11}B, Vol. 29, fol. 287, "Etat . . . ," 31 December 1750.
50 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
51 AN, Col., C^{11}B, Vol. 10, fol. 242(v), Verrier to the Minister, 18 December 1729, cited in Jean Hankey, "The Powder Magazine and the Barracks of the Dauphin Bastion," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1968, p. 1.
52 Yale University, Library, "A Plan of Louisbourg: Intended only to Show by strong red the publick buildings lately erected and by faint red such as have had a thorough repair," 1746.
53 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751; AN, Col., C^{11}B, Vol. 33, fol. 229(v), "Etat . . . ," 9 October 1753.
54 AN, Col., C^{11}B, Vol. 35, fols. 32-34(v), Drucour and Prévost to the Minister, 19 June 1755.
55 PAC, Map Division, H 240, op. cit.
56 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
57 Bruce W. Fry and Charles S. Lindsay, op. cit., pp. 81-107.
58 AN, Col., C^{11}B, Vol. 28, fol. 342, "Etat . . . ," 31 December 1749.
59 Ibid.
60 Ibid.
61 Ibid.
62 Ibid., Vol. 10, fol. 143(v), "Estimation des ouvrages projettées pour le demy bastion Dauphin, et de la Batterie qui donnera dans le port, pendant l'année 1728 et les Suivants relative au plan et profile cy joint," 15 November 1727.
63 Ibid.; AN, Col., C^{11}B, Vol. 28, fol. 342, "Etat . . . ," 31 December 1749.
64 Ibid., Vol. 10, fol. 143(v), "Estimation . . . ," 15 November 1727; Bruce W. Fry and Charles S. Lindsay, op. cit., pp. 89-90; AN, Col., C^{11}B, Vol. 13, fol. 12, Le Normant de Mesy, senior to the Minister, 3 February 1732.

Town Guardhouses

1 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
2 Iain C. Walker, "Preliminary Report, Excavations at King's Bastion, Fortress of Louisbourg, September to December, 1962," Manuscript on file, National Historic Parks and Sites, Louisbourg, 1962, pp. 29-32.
3 AN, Col., C^{11}B, Vol. 29, fol. 282, "Etat . . . ," 31 December 1750.
4 Ibid., Vol. 28, fol. 341, "Etat . . . ," 31 December 1750; AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
5 AN, Col., C^{11}B, Vol. 28, fol. 341, "Etat . . . ," 31 December 1749.
6 Ibid., Vol. 29, fol. 282, "Etat . . . ," 31 December 1750.
7 Ibid., Vol. 28, fol. 341, "Etat . . . ," 31 December 1749.
8 Ibid., Vol. 33, fol. 229(v), "Etat . . . ," 9 October 1753.
9 Ibid., Vol. 28, fol. 341, "Etat . . . ," 31 December 1749.
10 Ibid., Vol. 29, fol. 282, "Etat . . . ," 31 December 1750.
11 Ibid., Vol. 33, fol. 229(v), "Etat . . . ," 31 December 1753.
12 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 20 October 1744.
13 AG, Art. 14, No. 1, pièce 28, "Etat . . . ," 1751.
14 AN, Col., C^{11}B, Vol. 29, fol. 287(v), "Etat . . . ," 31 December 1750.
15 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
16 AN, Col., C^{11}B, Vol. 28, fol. 349, 31 December 1749.
17 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
18 Ibid.; AN, Col., C^{11}B, Vol. 33, fol. 230, "Etat . . . ," 9 October 1753.
19 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
20 Ibid.
21 Ibid.
22 AN, Col., C^{11}B, Vol. 28, fol. 349, "Etat . . . ," 31 December 1749.
23 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
24 AN, Col., C^{11}B, Vol. 33, fol. 230, "Etat . . . ," 9 October 1753.
25 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
26 AN, Col., C^{11}B, Vol. 33, fol. 230, "Etat . . . ," 9 October 1753.
27 AN, Section Outre-Mer, DFC, Order No. 201, "Toisé . . . ," 30 October 1744.
28 AN, Col., C^{11}B, Vol. 33, fol. 230, "Etat . . . ," 9 October 1753.
29 PAC, Map Division, H240, op. cit.

Primary Sources

Canada. Public Archives. Map Division.
A Plan of Louisbourg Survey'd and Drawn for His Excellency The Honble Major General Thos. Gage Commander in Chief of His Majesty's Forces in America. 1767.
Batterie Royalle de 40 canons de 36L. et de 22 cannons de 4L. sur les tours dans le por de Louisbourg a Lisle Royalle. Undated.

France. Archives du Génie.
Article 14. (Places étrangères: Louisbourg et Ile Royale.)
Plan De Louisbourg Avec Ses Augmentations faites pendant l'année 1720.
Plan du rez de chaussée du corps de Caserne et du Bastion du Roy 1724.
Plan des deux fronts de fortification, l'un d'entre le Bastion de la Reine cotté 2, celui de Princesse cotté 1, et l'autre d'entre le dit Bastion Princesse cotté 1, et celui de Brouillan cotté 10. 1751.
Plan du Bastion du Roy cotté 3, nommé communement le fort, pour servir au Projet de l'aggrandissement de la Place d'Armes 1752.
Plan de la Ville de Louisbourg En L'Isle Royale. 1758.
Le Bastion du Roy Superieur aux Autres Bastion De La Ville de Louisbourg. Undated.

France. Archives Nationales. Colonies.
C^{11}A, Correspondance générale, Canada, 1540-1784.
C^{11}B, Correspondance générale, Ile Royale, 1712-1762.
C^{11}B, Vol. 39, Plan de la Porte Dauphine de Louisbourg 1733; Louisbourg 1756. Plan du front d'entre les Bastions du Roy cotté 3, celuy de Dauphin cotté 4, et la Mer.

France. Archives Nationales. Section Outre-Mer. Depôt des Fortifications des Colonies.
Plan de Louisbourg Ou est Representé en Couleur Jaune les Ouvrages a faire pour perfectionner la Nouvelle Enceinte pendant Lannée 1741. Louisbourg 1751. Plan du front de fortification d'entre le Bastion du Roy Cotté 3 celuy de Dauphin cotté 4 et la Tenaille de la Port Dauphin.
Plan de l'etat actuel des fortifications de Louisbourg dans le front du mur crenelé et dans celuy compris entre l'angle flanque du bastion Princesse et l'angle flanque du bastion de la Reine. 1754.
G^{2} (Registres des greffes du Conseil supérieur de Louisbourg)

France. Bibliothèque du Génie.
MS 131d (Mémoire ou traité de fortification)
Profils et Elevations de divers desseins de Corps de Garde . . .
Desseins de differentes tables et bancs et Ratteliers a posser les Armes et autres que l'on ce sert ordinairement aux Arcenal casernes et corps de Gardes.

France. Bibliothèque Nationale. Dept. des Estampes.
Vol. 20a. Bastion du Roy faisant partie de l'enceinte de la Ville de Louisbourg.

United States. Library of Congress. Map Division.
Plan du Cap breton dit Louisbourg Avec ses environs Pries par Lamiralle Bockoune 13 26 juillet 1758.

Yale University. Library.
A Plan of Louisbourg: Intended only to show by strong red the publick buildings lately erected and by faint red such as have had a thorough repair. 1746.

Secondary Sources

Adams, Blaine
"Construction and Occupation of the Barracks of King's Bastion." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1971.

Akerman, Jeremy B.
"Château St. Louis Central Passageway Research Report." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1966.

Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers, par une société de gens de lettres. Mis en ordre & publié par M. Diderot . . . & quant à la partie mathématique, par M. d'Alembert.
Briasson, Paris, 1751-65. 17 vols.

Fortier, John
"King's Bastion Report VIII, A Survey of the Terrain of the Citadel Area Prepared for the Purposes of Archaeological Excavation." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1965.

Fortier, Margaret
"Dauphin Bastion." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1966.

France. Laws, Statutes, etc.
Code militaire; ou Compilation des ordonnances des roys de France concernant les gens de guerre, par De Briquet. Imprimerie royale, Paris, 1728. Vol. 1.

Fry, Bruce W. and Lindsay, Charles S.
"Excavation of the Dauphin Demi-Bastion, 1966-67." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1969.

Hankey, Jean
"The Powder Magazine and the Barracks of the Dauphin Bastion." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1968.

Harper, J. Russell
"The Fortress of Louisbourg: A Report of Preliminary Archaeological investigation . . ." Manuscript on file, National Historic Parks and Sites, Louisbourg, n.d.

Histoire générale de la marine, contenant son origine chez tous les peuples du monde, ses progrès, son état actuel, & les expéditions maritimes anciennes & moderne . . . .
P. Prault, A. Boudet, Paris, 1744-58. 3 vols.

Historians
"Preliminary Architectural Studies." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1971. Vol. 2.

Ordonnance du Roy Concernant les Gouverneurs et Lieutenant-Gouverneurs des Provinces . . . du 25 juin 1750.
Duchamp, Arras, 1750.

Thériault, Yvette
"Occupation-Destination-Ameublement du Château St. Louis." Manuscript on file, National Historic Parks and Sites, Louisbourg, 1966. Vol. 5.

Walker, Iain C.
Archaeological Report of the North Half of the Château. Manuscript on file, National Historic Parks and Sites, Louisbourg, 1964.
"Preliminary Report, Excavations at King's Bastion, Fortress of Louisbourg, September to December, 1962." Manuscript on file, National Historic parks and Sites, Louisbourg, 1962.

A Survey of Louisbourg Gunflints

by T. M. Hamilton and Bruce W. Fry

Canadian Historic Sites
No. 12

102 **Abstract**
102 **Acknowledgements**
102 **The Historical and Archaeological Background**
102 Introduction
103 King's Bastion
104 The King's Bastion Barracks
105 Magazin du Roi
105 Hangard d'Artillerie
105 De Couagne Property
105 Villejouin/Fizel and Richard Properties
107 De Pensens-De Lavallière Property
107 Lartigue Property
107 King's-Dauphin Curtain Wall
107 **The Louisbourg Gunflints**
107 Classification of Gunflints
109 French Specifications on Gunflints
109 The French Gunflint Contract of 1740
110 The Louisbourg Garrison and Its Supply
113 Method of Study
113 The Gunflints Cache from Battery Island
115 Gunflints from the Town of Louisbourg
115 *King's Bastion*
116 *Barracks*
117 *Magazin du Roi*
117 *Hangard d'Artillerie*
117 *De Couagne Property*
117 *Villejouin/Fizel and Richard Properties*
119 *De Pensens-De Lavallière Property*
119 *Lartigue Property*
119 *King's-Dauphin Curtain Wall*
119 **Some General Comments on Specific Problems**
119 On Dutch Gunflints
121 On Fireflints and Firemaking
122 On the Width of Early French Gunflints
123 On the Pseudo-Dutch Gunflints
123 **Conclusions**
123 The Battery Island Gunflints
124 The Gunflints from Within Louisbourg
125 **Appendix A: Dimensions of French Gunflints**
128 **References Cited**

Tables

114 *1 Battery Island Flints*
114 *2 Dimensions of Typical Battery Island Gunflints*
123 *3 Jaw and Frizzen Widths of Various French Arms*
125 *4 Frequency of French and Dutch Gunflints in Different Size Groupings.*

Illustrations

103 *1 Louisbourg Harbour.*
104 *2 Battery Island, plan and elevation, approximately 1740.*
106 *3 The town of Louisbourg, indicating sites from which flints were studied.*
108 *4 Basic gunflint types found at Louisbourg, and flints from Battery Island.*
111 *5 Gunflints from the Battery Island cache.*
112 *6 Chalk-heel gunflints from the Battery Island cache.*
115 *7 Gunflints from the town of Louisbourg.*
116 *8 Flints from Fort Frederica, Saint Simons Island, Georgia.*
118 *9 Flints from the town of Louisbourg.*
120 *10 Flints from the Lartigue property.*

Abstract
The discovery of a large cache of gunflints in a defence work protecting Louisbourg harbour led to a study of all measurable flints from this site together with gunflints recovered from nine excavated sites within the 18th-century town of Louisbourg. Two distinct types of gunflints could be distinguished, in accordance with a classification generally accepted by historic archaeologists, although the attribution of types to exclusive areas of manufacture implied by this classification is questioned. In addition, gunflints from the cache are regarded as constituting a distinct group within the whole Louisbourg collection on the basis of manufacturing technique and over-all appearance.

Documents dealing with the sites from which the gunflints were recovered were studied in an attempt to define context and chronological limits. Documents concerning the purchase and manufacture of gunflints for Louisbourg and for the French army were also studied in order to compare historical evidence on desirable qualities of military gunflints with archaeologically recovered specimens.

Submitted for publication 1971, by T.M. Hamilton, Miami, Missouri, and by Bruce W. Fry, National Historic Parks and Sites, Louisbourg.

Acknowledgements
Dr. Donald Baird of Princeton University supplied a copy of Skertchly's study of the manufacture of gunflints. This rare and almost unknown source has been invaluable in furnishing additional insight into the day to day problems of the knapper. Dr. Baird also made many of the translations from the French. Leone B. Hamilton assisted in the study of the gunflints and typed that portion of the manuscript.

The Historical and Archaeological Background

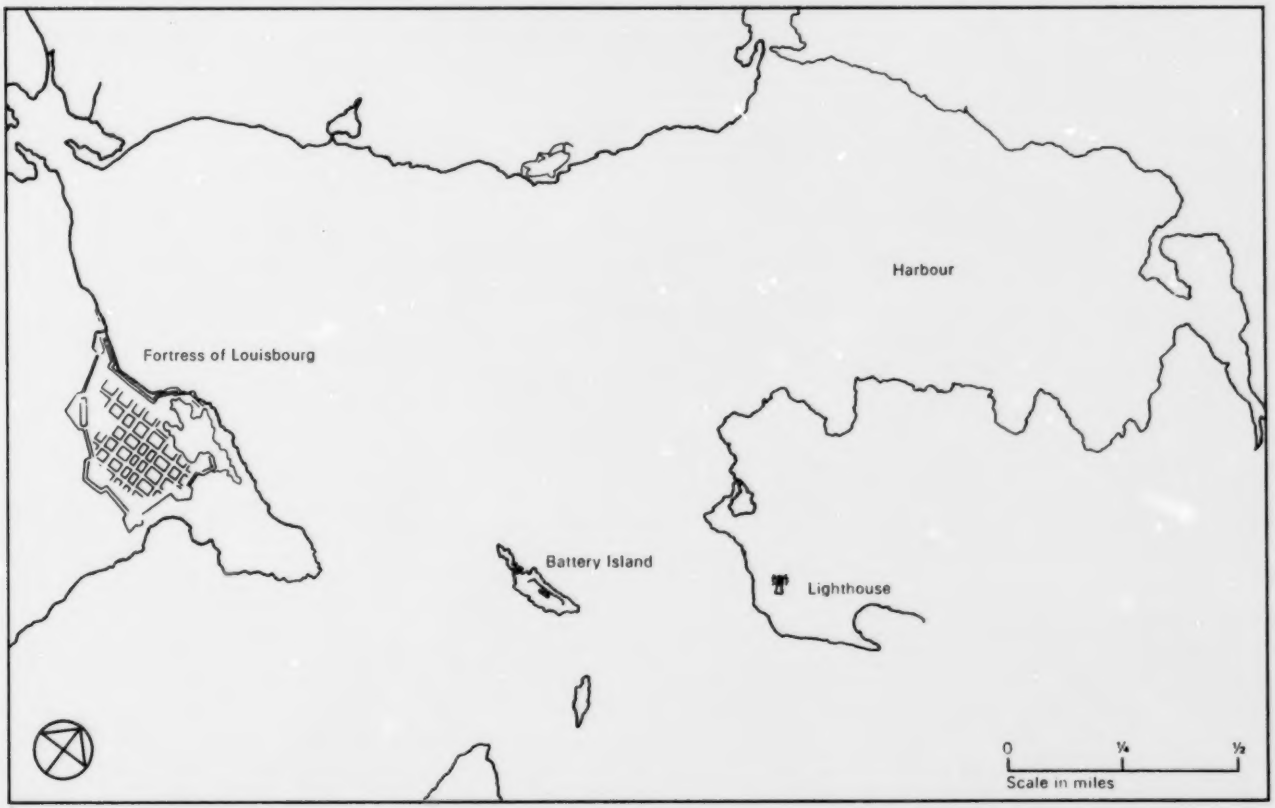
Introduction

The Fortress of Louisbourg, located on the exposed Atlantic coast of Cape Breton Island, affords an exceptionally well-preserved French site of the early 18th century with evidence of both military and social life over a short occupation period. Archaeological investigations of the fortifications, government structures and civilian properties within the town began in 1961 (Larrabee 1971).

Not included in this research to date is an interesting element of the defences guarding the narrow entrance to the harbour. On a rocky islet remote from the main fortifications and directly overlooking the only channel into the harbour, the French built an artillery battery which, by 1734, was complete with powder magazine and barracks for a small garrison (Figs. 1, 2). The island battery was bombarded into submission as a prelude to the capture of the fortress by colonial forces from New England in 1745 and again by the British in 1758; thereafter the fortification was not repaired or reoccupied.

While no comprehensive research has been carried out, exploratory excavations to determine the condition of the structures were undertaken by Donald McLeod in the summer of 1963. In the course of this work, a test pit in a room at the east end of the barracks yielded a cache of about 900 used and broken gunflints

1 Louisbourg harbour.



1

weighing about 18½ pounds (McLeod: unpublished notes and drawings on file at the Fortress of Louisbourg National Historic Park).

Because of the unusual nature of these flints, they were sent at a later date to the senior author for comment and study. Representative collections of flints recovered from excavations within the main fortress were also studied. The flints were selected from both military and civilian sites which had been fully excavated, a brief description of which is given below (for site locations, *see* Fig. 3).

King's Bastion

A large and complex element of the fortifications, the King's Bastion, was designed as a citadel for refuge in the event an attacking force succeeded in breaching the defences of the town. The excavations carried out in this area are described by Larrabee (1971). Construction of the bastion was begun in 1719 and finished in 1731; it was damaged in 1745 by the besieging forces from New England which subsequently occupied the fortress, made repairs to ruined areas and repaired the King's Bastion along with the rest of the defences. The French, upon returning in 1749, resumed occupation of the bastion and made further modifications to its defensive walls. The siege of 1758 saw the effective end of the bastion, which was badly damaged during the con-

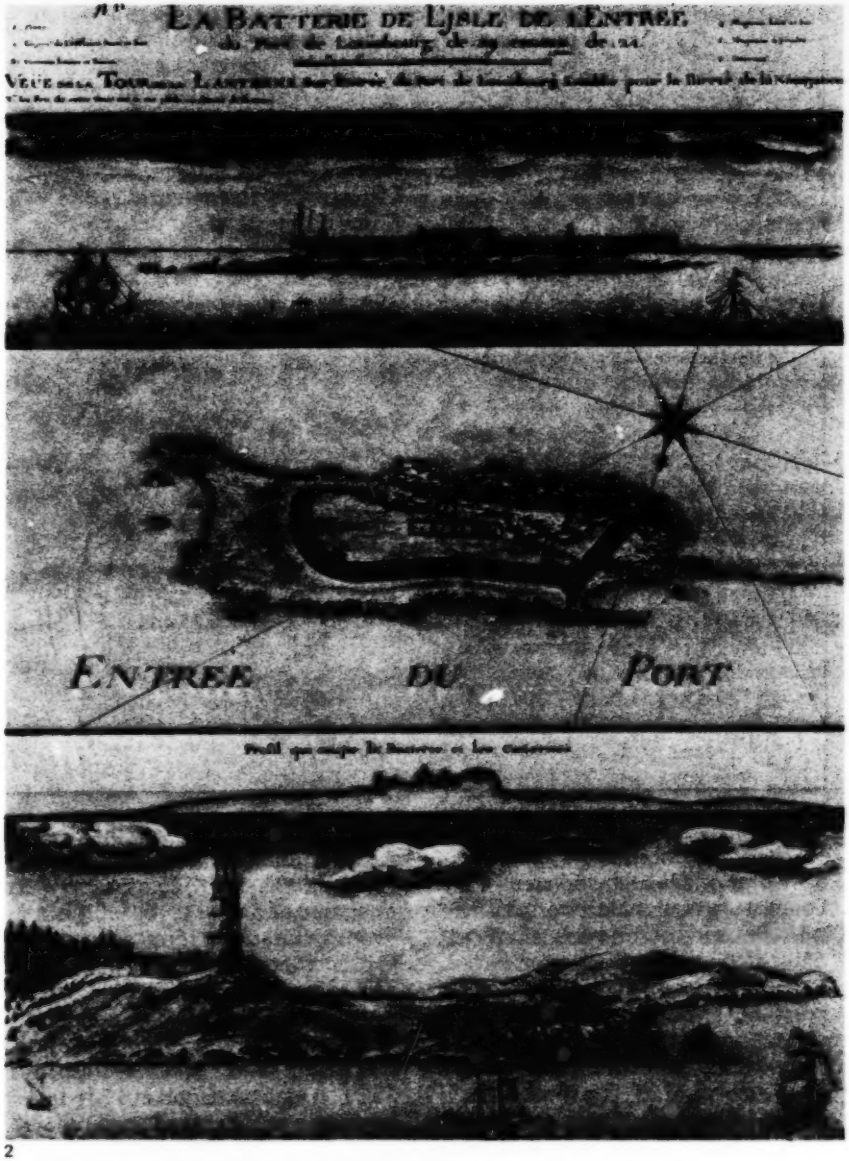
2 Battery Island, plan and elevation, approximately 1740. *(Archives du Génie.)*

flict and then demolished in 1760 by the British army.

Gunflints were found throughout the area, but the majority was recovered from the casemates of the right flank (38 of a total of 59). Flints were found in all casemates at all levels, although most came from the upper strata to which post-1750 dates have been assigned (Walker: 1971), the upper limit being fixed by the destruction at the end of that decade. As Walker's discussion shows, however, earlier material was incorporated in these later strata which were basically refuse deposits; together with a few specimens from lower strata associated with the earliest phases of the fortress, the gunflints from the King's Bastion should be considered as falling within a dating bracket of 1720-60.

The King's Bastion Barracks

An integral part of the citadel, the barracks was a massive, three-storey building located across the gorge of the King's Bastion. The south half of the building contained the governor's residence and council chamber, quarters for officers of the garrison, and a chapel; the north half served primarily as a soldiers' barracks. The whole building, begun in the 1720s and completed in the early 1730s, suffered extensive damage in both sieges and was practically in ruins at the end of the second siege in 1758, except for part of the governor's wing. The foundations were partially ex-



2

posed and stabilized during a restoration program in the 1930s, but when excavated in 1962-63 as part of the present restoration program, archaeologically significant strata were revealed, comprising occupational refuse and building collapse and containing substantial quantities of artifacts. The gunflints described in this report were all located in the northern or barracks section of the building in strata sealed by rubble that can be confidently attributed to the destruction of the second siege. The associated artifacts suggest a central date in the 1740s for these strata; the gunflints may thus be dated to a period between 1740 and 1758.

Magazin du Roi

Another government building, located in block 1, the Magazin du Roi (King's storehouse) was a well-documented stone structure in existence from 1727 until about 1768. Because of continual flooding, the original cobblestone floor was covered with a foot of gravel fill in 1739 or 1740. Four gunflints were associated with this structure: two were found in the rubble overlying this gravel; the other two were found in building collapse directly on top of the cobble walkway outside the building. All four are therefore associated with the later (1750s or 1760s) phase of the storehouse.

Hangard d'Artillerie

Located in town block 1, a block used exclusively for government purposes, the Hangard d'Artillerie was a low, single-storey masonry structure used for the storing of artillery pieces and shot, with a forge for repairs at one end. From the documentary evidence, the *hangard* appears to have been completed in December 1736, although it deteriorated rapidly and by 1745 the occupying New England troops considered it unsuitable for use and built their own ordnance store nearby. The French probably made little use of the building when they returned in 1749, and a large part appears to have been burnt in the fire which destroyed the adjacent bakery in 1756. After 1758, the British repaired part of it for use as an arsenal and then as a stable; after 1768 it fell completely into ruin.

Excavation revealed only a simple sequence of occupation and collapse, the majority of artifacts being found on a compacted earth floor. The gunflints, located randomly throughout the building, were found in association with musket balls and cannonballs which match French military specifications, and a variety of wrought iron artifacts of both British and French manufacture. On this evidence it is assumed that the later phases of the building, after repairs and cleaning-up, were reflected in the archaeological record and that the gunflints from this building may be dated to the 1750s.

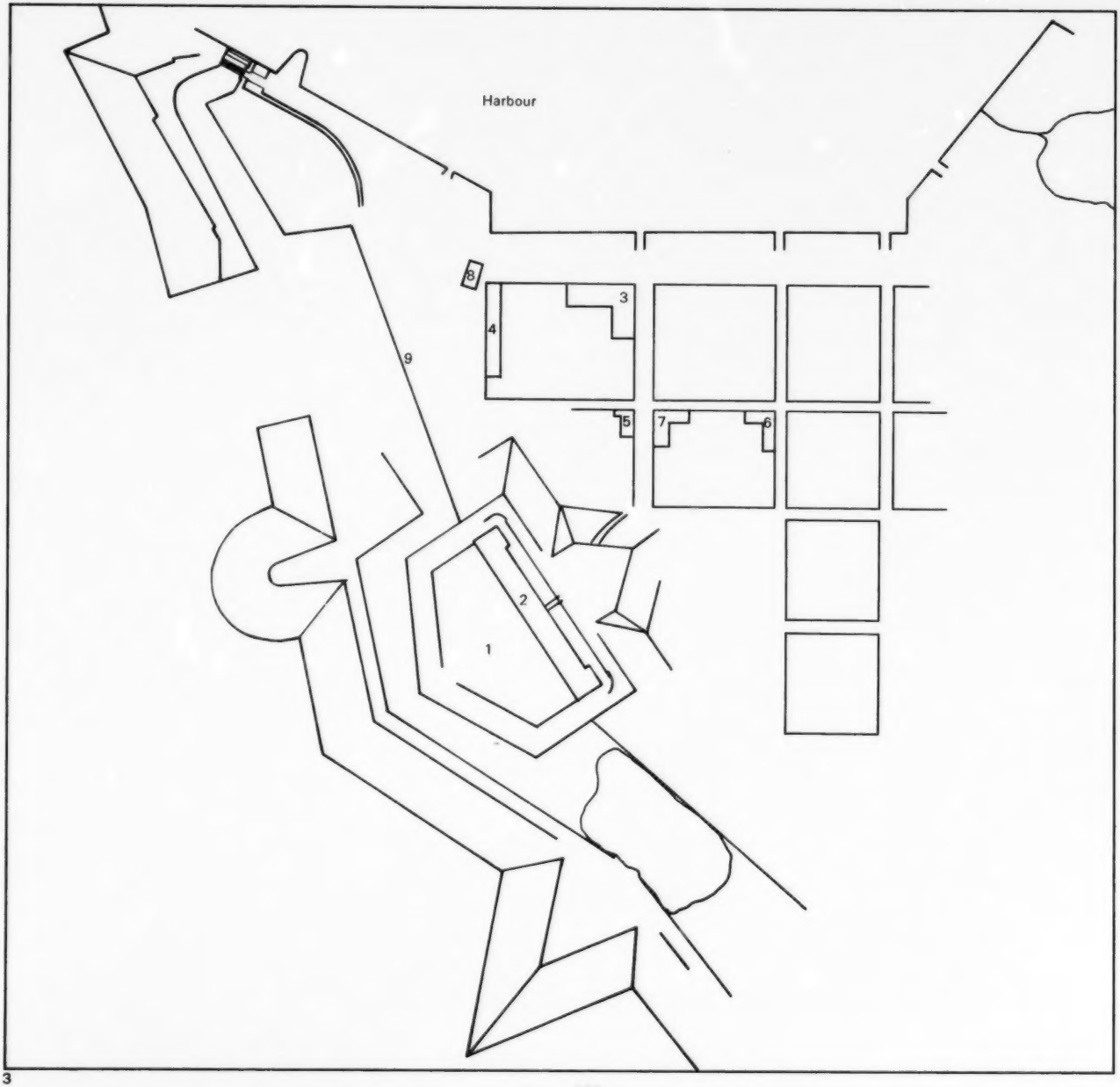
De Couagne Property

A property in town block 7 consisting of a masonry house built in 1722, replaced by a half-timbered house built in the 1730s by Jean Baptiste de Couagne and outbuildings and a storehouse built between 1741 and 1745, yielded a large quantity of flints found in the house itself as well as in the yard and storehouse. Unfortunately the site was a very shallow one, the modern sod level occurring immediately on top of the foundations and undisturbed natural soils, and no closely dated strata existed. The property was occupied continuously from 1721 until 1768, although ownership changed several times. From 1740 to 1758 it was occupied by ship's outfitters and merchants, and the flints found may represent this commercial function.

Villejouin/Fizel and Richard Properties

A private dwelling and adjacent back yard in the northeast corner of town block 16 yielded evidence of a rectangular wood-frame building on a stone foundation. The yard in back was filled with a rich, black earth containing artifacts in profusion among which gunflints were found. As usual in artifact assemblages at Louisbourg, both French and British material was present, and again the dating evidence from ceramic styling and from coins indicated that the strata in which the flints were found could be dated to the 1740s and 1750s. Indications of burning, together with cannon-balls and mortar shell fragments in the upper strata, support historical evidence that the house was completely destroyed in the siege of 1758, though some late 18th- and 19th-century British material was present in the modern root zone. From documentary evidence, the site appears to have been developed in the 1730s.

3 The town of Louisbourg, showing sites from which flints were studied. *1*, King's Bastion; *2*, Barracks; *3*, Magazin du Roi; *4*, Hangard d'Artillerie; *5*, De Couagne property; *6*, Villejouin/Fizel and Richard properties; *7*, De Pensens property; *8*, Lartigue property; *9*, Curtain Wall.



3

De Pensens-De Lavallière Property
Another property in block 16 containing both a residence and a warehouse was originally leased to Jacques de Pensens, an officer who also engaged in trading activities. In 1736 the house was sold to Michel Leneuf de Lavallière, another officer and trader, and was occupied by British troops from 1758 until 1768, following the second siege. The gunflints recovered during excavation were all found on the cobble sidewalk outside the residence or immediately below the modern sod layer in the back yard, and cannot be confidently dated very closely, although, being from the upper strata, they may be presumed to belong to the late 1750s and 1760s.

Lartigue Property
Located in low-lying, marshy terrain adjacent to the quay, a property developed by Joseph Lartigue, a merchant and town official, yielded evidence of a simple rectangular house of half-timber construction on a stone foundation. Stratification was rudimentary, consisting of earth fill on top of the old marsh level, with the floor of the house set directly on the fill. Subsequent to abandonment, the site reverted to its former marshy condition, and a thin layer of swamp grass and mud was all that covered the area. Documentary sources indicate an initial date in the 1730s with continuous occupation until 1785; the original owners reoccupied the property after the New England occupation of 1745-49. After the second siege, there is some indication that British troops used the house as a stable, although this is not reflected in the artifacts recovered. The artifacts are predominantly French, with some British or New England material that dates to the first occupation rather than the second. The gunflints from this site would therefore be of the period between 1730 and 1758.

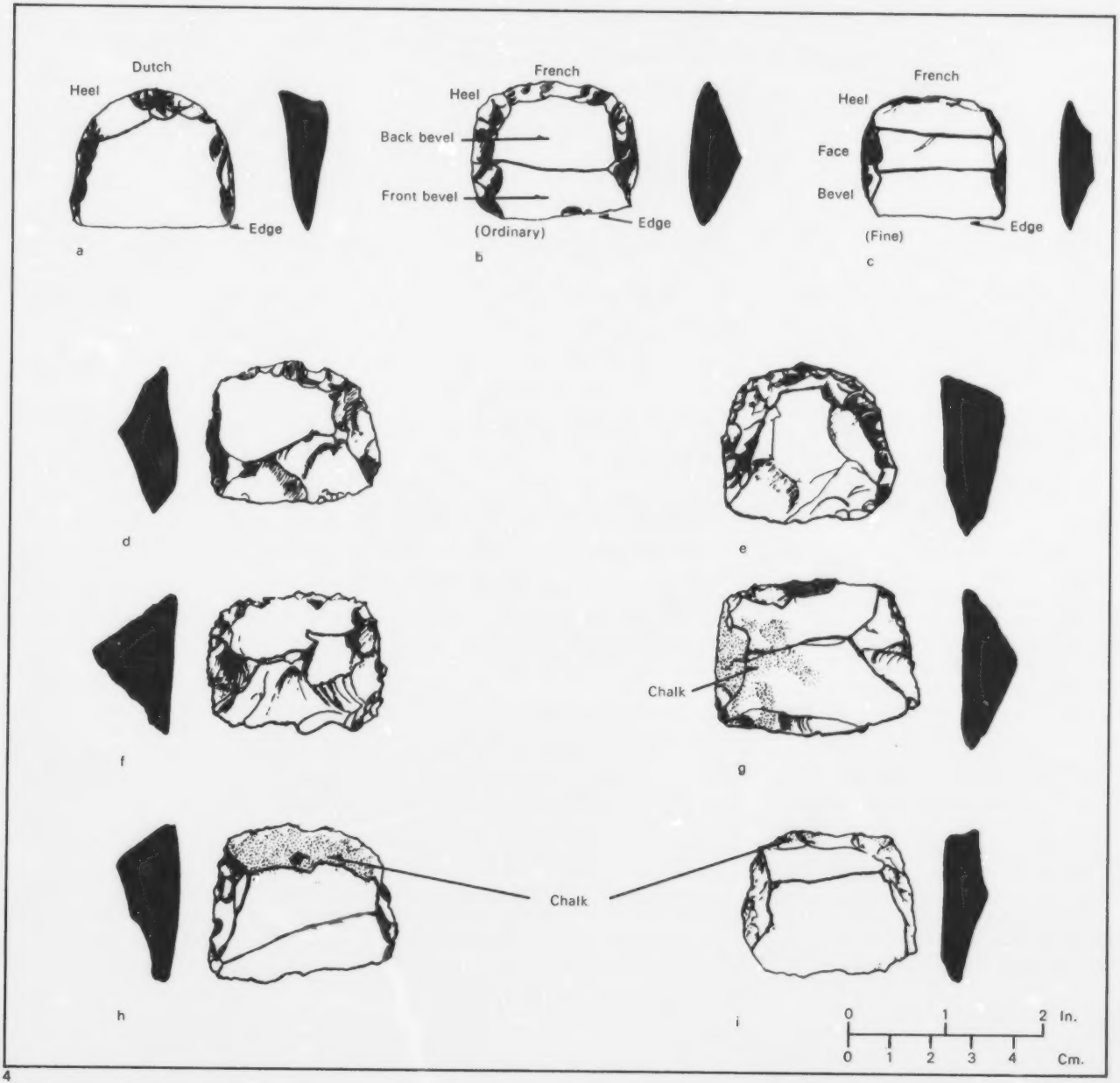
King's-Dauphin Curtain Wall
Interconnecting the bastions were lengths of curtain wall which consisted of an earthen rampart mass sloped in back and revetted in front by a masonry escarp surmounted by a parapet. Excavation of the curtain between the King's and Dauphin bastions yielded three gunflints, all from the same trench. They were found in a refuse layer on top of the rampart fill near buildings constructed after the first siege. Refuse from these buildings was simply deposited on the slope of the nearby curtain wall, and it is therefore more reasonable to associate the flints with this material, dating to the 1750s, than with the ramparts themselves.

The Louisbourg Gunflints
Classification of Gunflints
Our discussion of the ratios of one type of gunflint to another will adopt the classifications of John Witthoft as set forth in his paper entitled "A History of Gunflints" (1966), with certain reservations concerning his thesis that all of the so-called Dutch gunflints had their origin exclusively in The Netherlands. The reasons for these reservations will be explained under the section entitled "Some General Comments on Specific Problems."

Briefly, Witthoft has found that gunflints of European origin fall into four distinct types: Nordic, Dutch, French and English. Nordic gunflints were made from Baltic flint and were in use from the late 16th century to about 1675. Dutch types were made from flint which Witthoft has traced to the Riss outwash in The Netherlands. These flints dominated the trade from about 1650 to 1750. According to Witthoft, the third type, French flints, first made their appearance in very limited quantities about 1700, were not widely distributed until after 1740, and were, for all practical purposes, the only kind used, by the English as well as the French, by 1775 (Witthoft 1966: 28). Witthoft is also of the opinion that before 1760 most French flints were intended for fire-making, whereas the Dutch flints were primarily for use in firearms (Witthoft 1966: 29). Neither the Nordic nor the fourth type, the English gunflints, will concern us here since not a single example of either has been found so far at Louisbourg. This fits Witthoft's thesis that Nordic flints would have been out of use for perhaps 50 years when Louisbourg was founded, and English gunflints would not have entered North America until some 20 or more years after the fall of the fortress.

Dutch gunflints are basically spalls struck individually from the surface of the nodule of flint. A typical spall gunflint bears a bulb of percussion on the upper conchoidal sur-

4 *a, b, c,* basic gunflint types found at Louisbourg; *d–i,* gunflints from Battery Island showing peculiarities; *d,* bulb of percussion with conchoidal surface on back bevel; *e,* roughly flaked front bevel; *d–f,* are roughly flaked; *g–i,* are chalk-heels.



4

face in the area of the heel, with the face sloping down to the edge. As shown in Figure 4, *a*, the heel and sides are shaped by secondary chipping. The bottom face or bed of the Dutch flint often shows the negative impressions of portions of other spalls previously removed.

Both the English and French made their gunflints from a long blade struck from a core with a prepared striking platform, but once the blade had been struck off all similarities ceased. The French broke their blades into more or less uniform lengths which were then dressed on the sides and heel, usually in the same manner as the Dutch gunflints, giving the product a sort of gnawed appearance on those three sides. Ideally, the best quality French gunflint is trapeziform in outline when viewed from the side; the flat upper face, parallel to the bottom face or bed, furnished a firm gripping surface for the lead or leather cap which cushioned it between the jaws of the cock. This high-grade French gunflint is shown in Figure 4,*c*, and will be described in this paper as "fine." Gunflints with a triangular cross-section in side view (Fig. 4,*b*) were less desirable. The term "ordinary" will be used when speaking of flints of this quality. Good gunflints of fine or ordinary quality should be of uniform thickness from one side to the other, so the jaws of the cock can get a firm grip on the flint.

French Specifications on Gunflints

The only published specifications on gunflints of which the authors are aware date from the 19th century. Those appearing in the United States Army Ordnance Manuals for 1841 (Fuller 1936: 68) and 1848 (Lewis 1956: 159-60) are direct translations from the French *Aide-Mémoire* of 1831 or 1844 (Huntington: 1968 personal communication) for the use of artillery officers, the only change being that the dimensions were converted from millimetres to inches and the comment interjected that gunflints "are generally obtained from England or France." This last statement can cause considerable confusion if taken too literally.

The United States Army may have used both French and English gunflints during the first half of the 19th century, but the English flints did not conform to the specifications listed in the ordnance manuals. Both the French and English flints tend to be rectangular rather than square, but, whereas the English gunflints generally have their longer axis parallel to the lockplate and the barrel of the gun, the French are just the opposite. When speaking of dimensions or trying to apply the French specifications, the length is always the distance from one side to the other, while the width is the distance from the heel to the edge.

The French Gunflint Contract of 1740

As convenient as it might be to compare the Louisbourg flints, which fall within the period from 1713 to 1760, with the specifications derived from the French *Aide-Mémoire* of 1831 or 1844, any conclusions would be meaningless for there is no assurance that the French requirements, and hence their specifications, remained the same during that interval of 100 years or more. In our search for some authoritative information on French gunflint specifications in effect during the time when the Fortress of Louisbourg was in being, we have been most fortunate in enlisting the help of M. Jean Emy, Director of the *Musée de la Pierre à Fusil* at Meusnes (Loir-et-Cher), France. He has searched the French archives for us, and the results of his research will be found in Appendix A. M. Emy has been able to locate the only known gunflint contract which was awarded during the period of the French occupation of Louisbourg and in which specifications on size are included, but its date of 1740 places it exactly in the middle of that period. There can be no question that this contract of 1740 dealt specifically with flints classified by Witthoft as French, because the length of the bevel, a feature lacking in his Dutch type, is included. This is therefore an important piece of evidence in establishing that gunflints of Witthoft's French type were in fact being bought at this early date for use by the French army and that the French were not relying solely upon gunflints manufactured in the style of Witthoft's Dutch type.

Even a casual reading of the data (Appendix A) reveals a constant relaxing of specifications through the years as the authorities attempted to accommodate to the realities of gunflint manufacture and delivery. They seem never to have comprehended that the knappers struck off the flints free hand and measured by eye. Therefore, precise measurements

which today result in dimensions with a variation of less than one millimetre, have no significance in this study.

The true value of the 1740 contract lies not in telling us what really was delivered, but in serving as an indicator of what the authorities of that time considered the ideal gunflint for a specific weapon. In short, we can say with confidence that the French, during the period the Fortress of Louisbourg was in being, considered 34 mm. to 36 mm. the ideal length for a gunflint for use in their service muskets and rampart guns. As will be seen, it is impossible to reconcile this ideal with what they actually took into stores.

In working with gunflints recovered from archaeological sites, the length (in the case of French gunflints) and the thickness are usually the only dimensions which can still be measured, since the normal use to which a flint was subjected destroyed the edge and reduced the width of the bevel. Analysis must necessarily centre upon the dimension of length since only it is of significance in the majority of instances.

Thickness is of secondary importance, and to attempt to include it too would cause unnecessary complications. The only practical requirement was that the gunflint be thin enough to fit conveniently between the jaws of the cock after being cushioned in leather or lead.

Unfortunately, the French gunflint specifications of 1740 apply only to musket flints; the rampart or wall guns of that period, however, had frizzens and cocks of approximately the same size as those of the musket (Boudriot 1963: Cr. 10, pl. 3, p. 8). Pistol locks were only slightly smaller, especially for the cavalry and dragoon models (Boudriot 1963: Cr. 10, p. 11).

The Louisbourg Garrison and Its Supply

The Louisbourg garrison during the over-all occupation period was relatively small. In the 1720s there was a maximum of 360 men; in 1739, there were 480 French and 100 Swiss and in 1745, there were approximately 600 men. From June of 1745 to June of 1746, there were 2,500 to 3,000 New Englanders, and from 1746 to 1748 there were over 2,600 British troops including 1,080 New Englanders. The French returned in 1749 with 1,200 men plus an artillery company; by 1758 this number had been increased to approximately 3,500 men including four battalions of regular troops (McLennan 1957: 95, 165, 173, 188, 263). In 1758, there were four British regiments stationed in Louisbourg, but this number was rapidly reduced. From 1760 to 1768, there were no more than 300 men in the garrison (Foster 1965: 1-3).

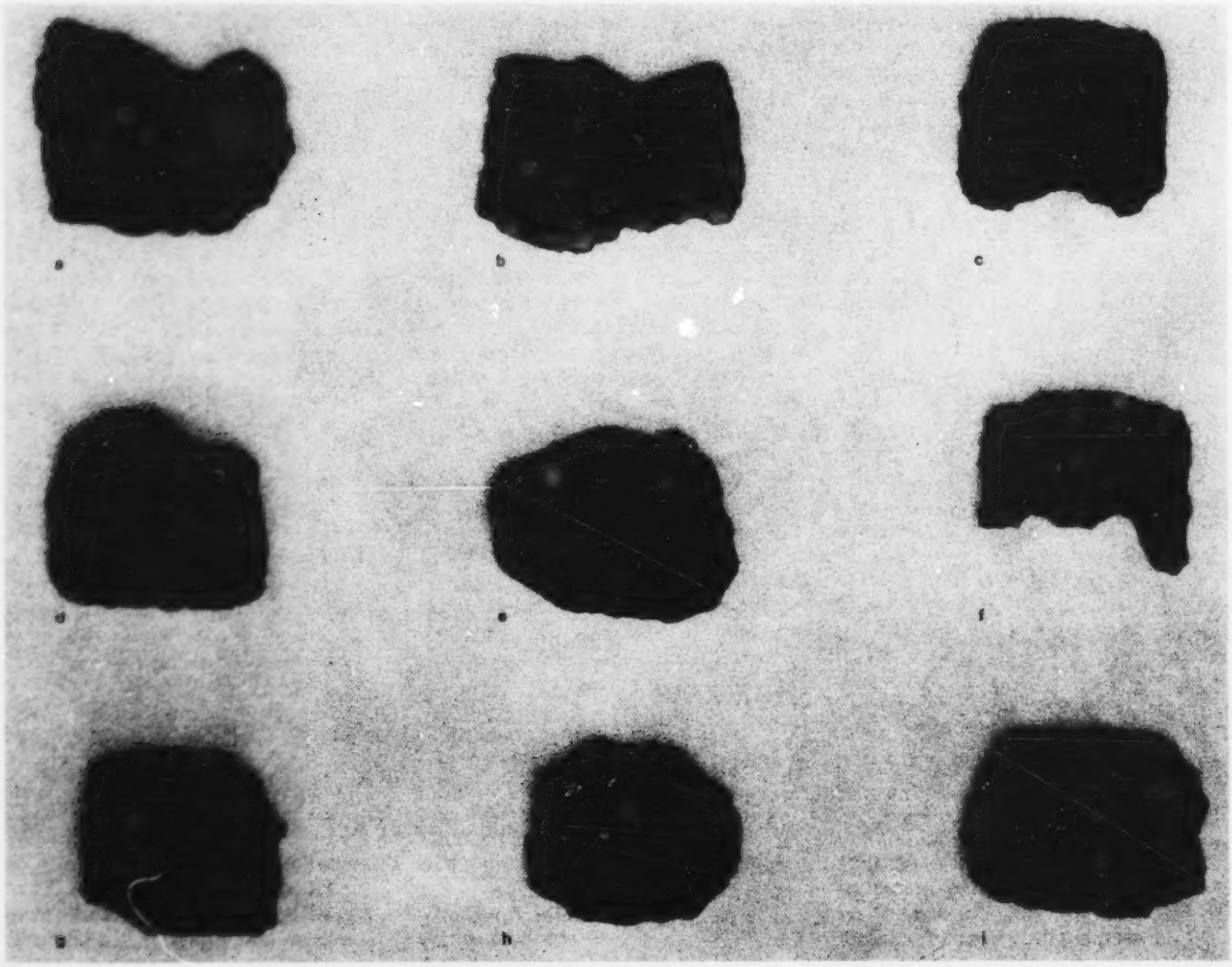
The problems of supplying Louisbourg from France were often difficult and the results were sometimes undependable. Each year the governor and *commissaire-ordonnateur* of the colony sent an annual request for supplies to the Minister of the Marine in France. When this list had been approved, the minister contacted those concerned with supplying the colonies, for example, the *intendants* of the French ports and the *munitionnaires*, and informed the governor and *ordonnateur* that this had been done. On 17 May 1741, he wrote:

Tous ce que j'ay pû faire cette année pour mettre la Colonie de plus en plus en etat de Deffense en cas d'Evênement, a ete d'ordonner l'Envoy de 15 m^ers de poudre au dela des 49 Q^x 38^L 10 onces [i.e. 49 quinteaux 38 livres 10 onces] que M. Bigot a demandes pour parfaire les 40 m^ers qui doivent rester en provision, de vous faire pareillement envoyer 20 Q^x de balles de 18, 20, et de 48, a la L., 30 m^ers de pierres a fusils et 800 fusils grenadiers avec leurs Bayonnettes, Parceque j'ay remarqué que ce sont là les articles les plus necessaires.
[*All I have been able to do this year to put the Colony more and more in a state of defence in case of emergency has been to order the shipment of 15 thousandweight of powder above and beyond the 49 quintals 38 pounds 10 ounces that M. Bigot requested in order to complete the 40 thousandweight that should be kept in store, likewise to have you sent 20 quintals (hundredweight) of balls of 18, 20 and 48 to the pound, 30 thousand gunflints and 800 grenadier fusils with bayonets, because I noted that those are the most necessary articles.*] (France. Archives Nationales, [hereafter cited as AN], Col. B, Vol. 72, ff. 358-65. Minister of the Marine to Du Quesnel and Bigot, 17 May 1741.)

On 22 February 1745, the minister wrote again concerning gunflints.

J'ecris au S^r abbé de Lacombe de pourvoir a cette ile 460 fusils Grenadiers... Je vous recommande pa-

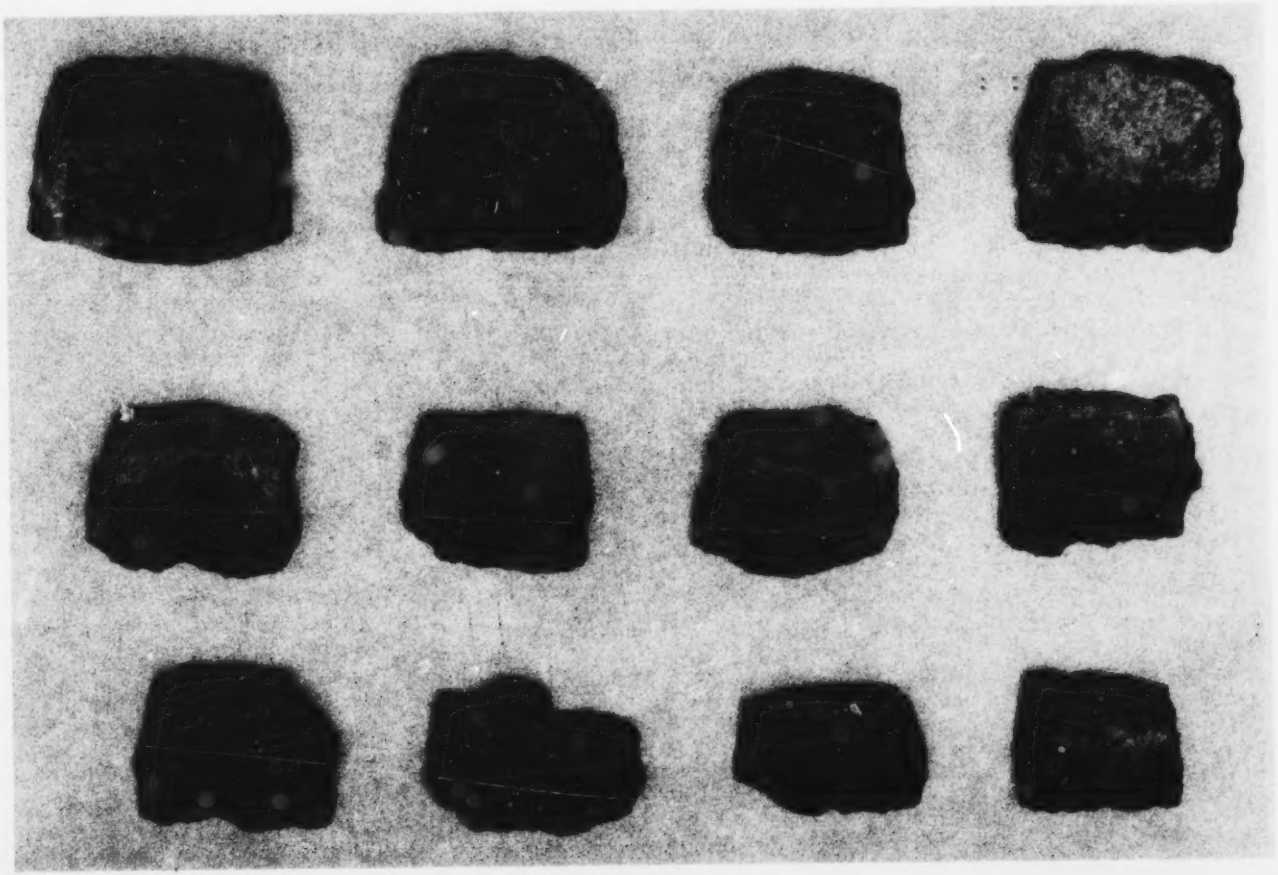
5 Gunflints from the Battery Island cache. *a*, roughly made gunflint, diminishing in thickness from left to right; *b*, double-edged form resembling a 19th-century fireflint; *c*, *f*, conventional French gunflints; *d*, *g*, pseudo-Dutch flints; *h*, *i*, roughly made flints.



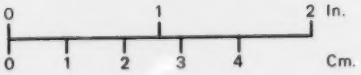
5

0 1 2 In.
0 1 2 3 4 Cm.

6 Chalk-heel gunflints from the Battery Island cache.



6



reillement de veiller a ce que les pierres a fusil qu'on demande par cet etat soient bien choisies car on se plaint que celles qui ont depuis quelques années esté envoyés dans la Colonie se sont trouvés de mauvaise qualité. [*I am writing to Sr. Abbé de Lacombe to attend to* [*the supplying*] *of 450 grenadier fusils... I charge you similarly to see to it that the gunflints that are requisitioned on this account are of good quality and well selected, because complaint is made that those sent to the Colony in the last several years were found to be of poor quality.*] (AN, Col., B, Vol. 81, pp. 395-7. Bigot to Ricouart, 22 February 1745.)

But the most revealing comment came from Governor DuQuesnel and the *ordonnateur* Bigot in Louisbourg, complaining to the minister in 1740, "Nous manquons aussi de bonne pierre a fusil; il y en a quantité de milliers en magasin qui sont de rebut." [We also lack good gunflints; in store there is a quantity of some thousands which are condemned.] (AN, Col., $C^{11}B$, Vol. 22, ff. 82-3v. Bigot and Du Quesnel to Minister of Marine, 5 December 1740.)

Method of Study

All groups of gunflints, both French and Dutch, were divided into three sizes; those less than 34 mm. long; those falling between 34 mm. and 36 mm. (which approximates the sizes called for in the contract of 1740), and those over 36 mm. long. To provide definite information on actual sizes of the gunflints in use we have shown the measurements of every specimen which was in original or near-original condition. These measurements are in millimetres, given as a series of four numbers separated by dashes which represent length, width, length of bevel and thickness, in that order. Where a Dutch flint measurement is given, the third position is shown as a zero since Dutch gunflints do not have a bevel in the same sense as the French.

Gunflints have not been found in an archaeological context which can be identified as of exclusively French or British affiliation. However, since not a single English gunflint has been found at Louisbourg, their very absence confirms Witthoft's contention that the English flints were not introduced into America until the latter half of the 18th century (Hamilton 1960: 74). [Since this paper was written, one English flint was found, but its context was late 18th century; it was found in a house in Block 2 used by a British settler well after the fall of the fortress.] The obvious conclusion is that during the two occupations of Louisbourg, the New Englanders, both military and civilian, used either Dutch or French flints and the flints cannot be relied upon to determine the nationality of the occupying force at any given time.

The Gunflint Cache from Battery Island

A test excavation to determine the limits and state of preservation of the barracks revealed a cache of gunflints in the northeast corner of the end room of the barracks. Perhaps the most remarkable thing about this cache is the number of broken bits and pieces. It may represent policing of the grounds, for many of the fragments are so broken that their original length cannot be estimated and still others are mere slivers. Fragments were excluded from the study if there was any question about the original length. These pieces were then weighed and found to be 4½ pounds, or approximately one-quarter of the total weight of the cache. In the course of the study, four Dutch gunflints and two more probably of that type were observed and set aside.

Once the fragmentary pieces had been removed and the French gunflints spread out, it became evident that the whole pieces were, in general, of remarkably low quality. The flint tended toward either a greyish or reddish cast. Grey French flint can be of excellent quality, but the majority of these were marked with an excessive amount of white inclusions as well as flaws, while the flint with the reddish cast was obviously of poor grade, since its flaking was erratic in the extreme. Furthermore, there were many gunflints which, though made from blades, had been chipped out individually to make the face; others somewhat resembled Dutch flints but lacked the conchoidal face and the bulb of percussion. These will be referred to as rough and pseudo-Dutch respectively. The pseudo-Dutch flints should not be confused with the pseudo-Clactonian gunflints described by Witthoft (1967: 37), which the senior author has so far been unable to identify.

Another peculiarity was the high percentage of "chalk-heels." These are gunflints made from blades still retaining part of the chalk cortex of the original nodule. In preparing the core before striking off the blades, this outer chalk rind was normally removed. Chalk-heels were always considered a low grade in the trade and, before examining this cache, the senior author had seen perhaps only three or four out of a total of many hundreds of gunflints. However, chalk-heels here represented 26 per cent of the entire number of measurable gunflints.

All 541 gunflints were divided into the three categories by length and further subdivided into regular gunflints and chalk-heels. The latter were surprisingly uniform in size, but the regular gunflints fell into the following groupings:

1) Low grade; poor quality flint with excessive inclusions or faulty flaking tendencies, or gunflints showing inexpert knapping with sloping faces or ridges.

2) Rough. At first appearance these seemed to be made from individual chunks of flint with much chipping and flaking on the face; however, they are all unifacial and had originally been sectioned from blades as had all the other French flints in the cache.

3) Pseudo-Dutch gunflints, which have been described above.

4) Standard grade, which were subdivided into fine and ordinary.

Table 1: Battery Island Flints

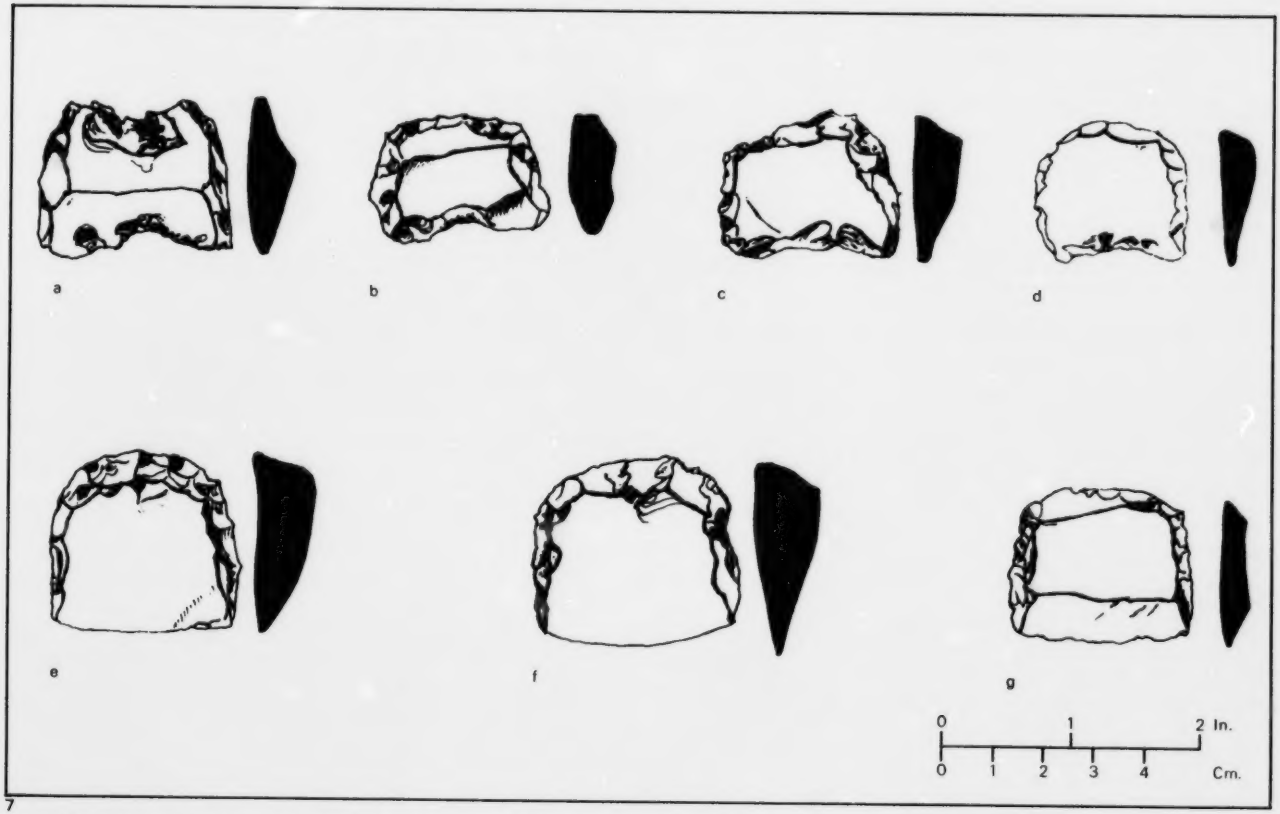
Groups	Less than 34 mm.	34 mm. -36 mm.	Over 36 mm.	Total
Low grade	118	93	96	307
Rough	12	2	4	18
Pseudo-Dutch	5	8	7	20
Fireflints	3	1	6	10
Standard, fine	5	1	2	8
Standard, ordinary	17	11	9	37
Total regular	160	116	124	400
Chalk-heels	54	67	20	141
Over-all total	214	183	144	541
Per cent unbroken	39	34	27	

Table 2: Dimensions of Typical Battery Island Gunflints

Flint No.	Size (mm.)	Type	Dimensions (mm.)
1B77E1-1	<34	Chalk-heel, Pseudo-Dutch	17-18-0-7
1B77E1-33-4	<34	Rough	28-33-?-11
1B77E1-33-1	34-36	Standard, fine	34-31-16-8
1B77E1-75	34-36	Standard, fine	34-31-?-6
1B77E1-35	>36	Pseudo-Dutch	37-34-0-11
1B77E1-28	>36	Rough	38-34-?-14
1B77E1-37-1	>36	Standard, ordinary	42-37-20-13

None of the Battery Island gunflints was in unused condition, but the examples in Table 2 may be considered representative. Dimensions are given in millimetres representing length, width, bevel and thickness respectively. Where a question mark is shown for the bevel it indicates that the width is also questionable. Taken as a whole, the gunflints from the Battery Island cache are characterized by a squarish, chunky appearance. Though some of them have rounded heels, particularly among the two standard grades, a surprising number appear to be two-edged but actually have the heel backed, or blunted, square across with secondary chipping. This peculiarity is especially noticeable with the chalk-heels; the back bevel on many of them is simply the chalk cortex. Often there is no back bevel as such; the front bevel takes the place of the entire face of the gunflint and the back, covered with the chalk rind,

7 Gunflints from the town of Louisbourg, *a–d*, two French and two Dutch flints from the De Couagne property, used as fireflints; *e, f*, two large new Dutch flints from the Curtain Wall; *g*, an unusually thin French gunflint from the Hangard d'Artillerie.



7

runs almost straight down to the bed. In this respect they are similar to the pseudo-Dutch flints. There is a definite tendency for the chalk to be confined to the back of the gunflint; however, on one (1B77E1-112), the chalk is on the edge itself. The chalk on this specimen covers only a small area and the rest of the edge looks as if it has had some service; we believe however that the flint was knapped in this fashion and had never been used.

All in all, this group of 541 gunflints from Battery Island reflects no credit upon the French procurement officers of that period.

Gunflints from the Town of Louisbourg

King's Bastion (14 French, 45 Dutch)

All of the 14 French flints are made from an excellent quality of beeswax-

8 Flints from Fort Frederica, Saint Simons Island, Georgia. *a, b,* an English flint nodule from which Dutch style gunflints have been struck; *c–r,* examples of Dutch style gunflints made from English flint.

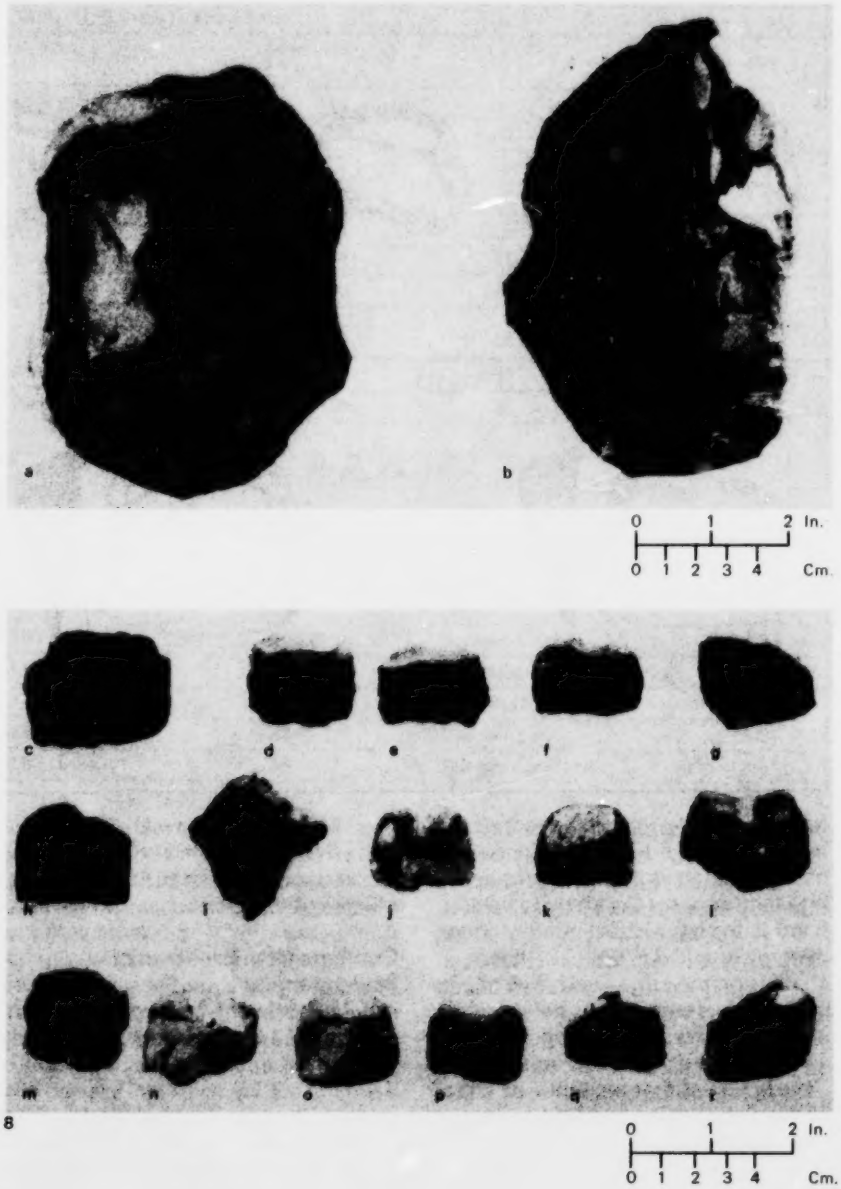
coloured flint, except for two which resemble the Battery Island gunflints. Twelve are classified as fine, two as ordinary. The following three could be measured:

1B4M736	36-30-14-7, fine, (good condition)
1B4B9	38 mm. long, ordinary. Resembles a Battery Island gunflint; grey with white inclusions.
1B4C16-5	26 mm. long, fine; an excellent small gunflint of beeswax colour.

Of the 45 Dutch flints, 16 are less than 34 mm. in length, 14 are between 34 mm. and 36 mm., 7 are over 36 mm., and 8 are broken. Eight of these 45 examples are in new condition:

1B4X1-290	31-30-0-8
1B14L35.1	28-25-0-8
1B14A241	32-28-0-7
1B10E15.1	34-30-0-8
1B10E3.3	36-27-0-8
1B14F79	36-26-0-8
1B14M17.11	34-33-0-8
1B4J15.2	37-36-0-11

Barracks (14 French, 25 Dutch)
The French gunflints recovered total 14, of which 3 are less than 34 mm. in length, 5 are between 34 mm. and 36 mm., and 5 are over 36 mm. One is broken. Of these 14 gunflints, 5 are made from a good quality beeswax-coloured material, but one has a



8

corner in white flint; it is not a chalk-heel. The remaining nine are badly burnt, but appear from the knapping to have been made from a superior quality of material, probably the standard French beeswax-coloured flint. All nine are of fine grade, and one of the smaller gunflints is in unused condition:

1B16C2.222	32-27-10-6

Of the 25 Dutch gunflints from this site, 12 are less than 34 mm. long, 3 are from 34 mm. to 36 mm., 5 are over 36 mm., and 5 are broken. Two of these are in new condition:

1B16Q2-44	36-28-0-9
1B16Q3.5	38-35-0-11

Magazin du Roi (3 French, 1 Dutch)
One of the three French gunflints is less than 34 mm. long, the remaining two being between 34 mm. and 36 mm. All are the colour of beeswax; two are fine and one ordinary. The smallest flint is wafer thin, 4 mm.

The lone Dutch gunflint has seen very little use and is made from a grey flint with white inclusions identified as coming from the Riss outwash:

1L1AA1	28-27-0-9

Hangard d'Artillerie (15 French, 40 Dutch)
Of the 15 French flints, one is less than 34 mm. long, 7 are from 34 mm. to 36 mm. in length, and 7 are over 36 mm. Thirteen of these are standard French while two resemble the Battery Island gunflints. These two are in good enough condition to be measured, as are four of the standard French:

1L16PQQ3	34-26-16-11, fine, (Battery Island)
1L16B2A	35-28-5-4, fine
1L16LL2	36-29-18-7, ordinary (chalk-heel)
1L1601	38-35-20-13, ordinary (Battery Island)
1L16LL2A	37-30-16-10, fine
1L16AA	36-30-9-6, fine

Of the 40 Dutch gunflints, 29 are less than 34 mm. long, 6 are between 34 mm. and 36 mm., and 5 are over 36 mm. Six of the flints under 34 mm. in length are in new condition and their dimensions are given below. None of the larger sizes are in good enough condition to be measured.

1L1603	30-26-0-8
1L16AA3	32-29-0-8
1L16D2A	32-30-0-7 (edge, paper thin)
1L16C2A	33-29-0-7
1L16D2B	31-28-0-8 (edge, paper thin)
1L16B2	31-23-0-7

De Couagne Property (13 French, 41 Dutch)
Five of the 13 French flints are less than 34 mm. long, one is between 34 mm. and 36 mm., 2 are over 36 mm. and 5 are broken. All of these are fine grade and made from standard quality beeswax-coloured flint except one specimen (17L2A2), which is ordinary but has a sloping ridge. It is similar to those found on Battery Island.

Two of these gunflints, though not new, had been used very little; one is the smallest yet found at Louisbourg and probably was used in a pistol:

17L7B2	19-18-10-5
17L5A2	40-32-11-7

Of the 41 Dutch flints, 25 are less than 34 mm. in length, 4 are between 34 mm. and 36 mm., 3 are over 36 mm., and 9 are broken. Eight of these 41 examples are in new condition:

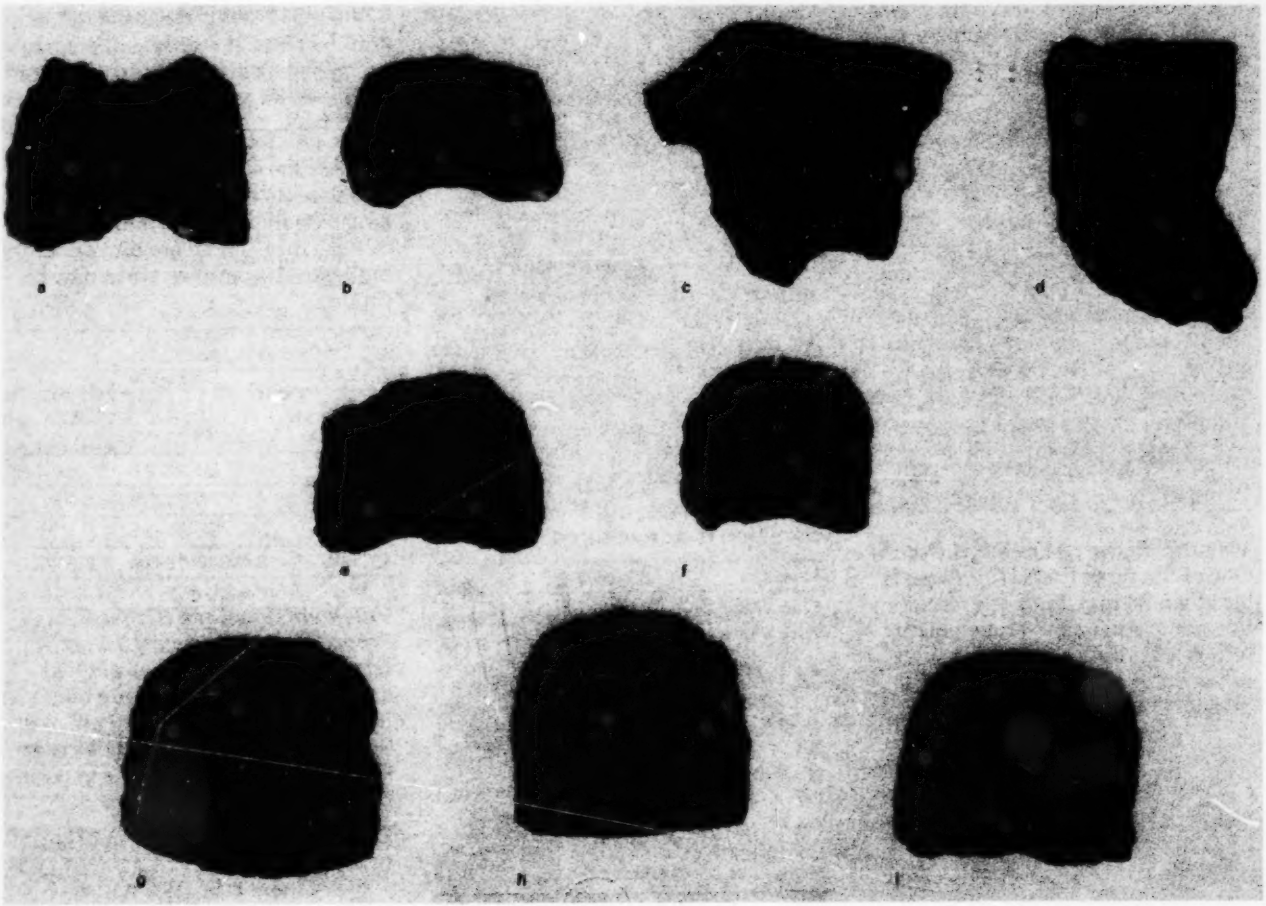
17L982	28-22-0-7
17L2A2	28-25-0-8
17L482	32-26-0-7
18L12D1	30-36-0-7
17L8A2	30-27-0-6
17L832	36-30-0-9
17L8B2	36-31-0-8
17L8B3	38-32-0-9

Villejouin/Fizel and Richard Properties (12 French, 13 Dutch)
Of the 12 French flints, 6 are less than 34 mm. in length, 3 are between 34 mm. and 36 mm., and 3 are over 36 mm. Two of the French flints are in new condition and one is in good condition:

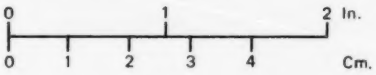
16L3B7	29-23-5-6, fine, (new)
16L2A14	35-27-13-7, ordinary, (new)
16L4A8	38-33-14-7, fine, (good)

The French gunflints are made from flint which ranged from grey to beeswax in colour. The grey had white inclusions similar to the Battery

9 Flints from the town of Louisbourg (cf. Fig. 7). *a–d*, two French flints and two unshaped flakes used as fireflints, from the De Couagne property; *e–f*, Dutch specimens used as fireflints from the De Couagne property; *g–i*, three large Dutch gunflints from the Curtain Wall.



9



Island gunflints, but of a better quality which resulted in better knapping.

Nine of the 13 Dutch flints are less than 34 mm. long, one is between 34 mm. and 36 mm., 2 are over 36 mm., and one is broken. Two could be measured:

16L4A24(A)	26-21-0-6, (fair)
16L4A2	32-26-0-6, (new)

De Pensens-De Lavallière Property (3 French, 14 Dutch)

Of the three French flints one is less than 34 mm. long, none occur in the 34 mm. to 36 mm. range, one is over 36 mm., and one is broken. All are fine and all are made from a good quality flint. None are complete enough to record their measurements.

The Dutch gunflints total 14. Eleven of these are less than 34 mm. long; there are none between 34 mm. and 36 mm., one is over 36 mm., and two are broken. Two of the 14 are in new condition:

16L23B2	32-30-0-8
16L23C1	31-26-0-8

Lartigue Property (8 French, 17 Dutch)

Five of the French flints are less than 34 mm. in length, and three are between 34 mm. and 36 mm. Six of these are fine and two are ordinary. Two have been burnt, but were probably made from beeswax-coloured flint, as are the remaining four fine flints. One of the ordinary gunflints is also made from beeswax-coloured flint. The other ordinary example (46L5A2) is made from a waxy grey flint with white inclusions, somewhat like the grey Battery Island gunflints except that it had good knapping qualities. The back bevel on this gunflint is quite long and the heel is rounded forward to the ridge, giving it a semicircular appearance. The front bevel has been worn back until it is now within about 10 mm. of the ridge. This is the only French gunflint in the entire collection which was noticeably wider than it was long when new.

One of the burnt flints has some retouching along the edge, but it was still in new condition before it was burnt:

46L552	31-27-10-6

Of the 17 Dutch gunflints, 10 are less than 34 mm. long, 3 are between 34 mm. and 36 mm., 2 are over 36 mm. and 2 are broken. A large flint 38 mm. long (46L4W3), is made from chert. One side shows the water-worn surface of the pebble from which it was made, indicating that it came from a stream bed or glacial drift. Another specimen (46L5BB2A), is made from a glossy black flint, (almost a chalcedony), which is similar to flint samples from the mines at Vitray, France. Most of the Dutch gunflints are made from flints similar to samples identified for us by Witthoft as coming from the Riss outwash. Three of these are in new or practically new condition:

46L4W4	28-25-0-8
46L431	30-26-0-7
46L5B3	34-26-0-9

King's-Dauphin Curtain Wall (No French, 3 Dutch)

Only three gunflints have been recovered from the curtain, all of which are huge Dutch flints. One has seen considerable use, but the remaining two are in new condition. They range from (1) a grey flint to (2) a darker grey to (3) a black flint with a grey band at the edge. It is difficult to imagine these huge gunflints being used in the lock of a musket. All three gunflints are expertly knapped:

50L3Q2a	38-36-0-10
50L3Q2b	42-37-0-12
50L3D2	38-34-0-12

Some General Comments on Specific Problems

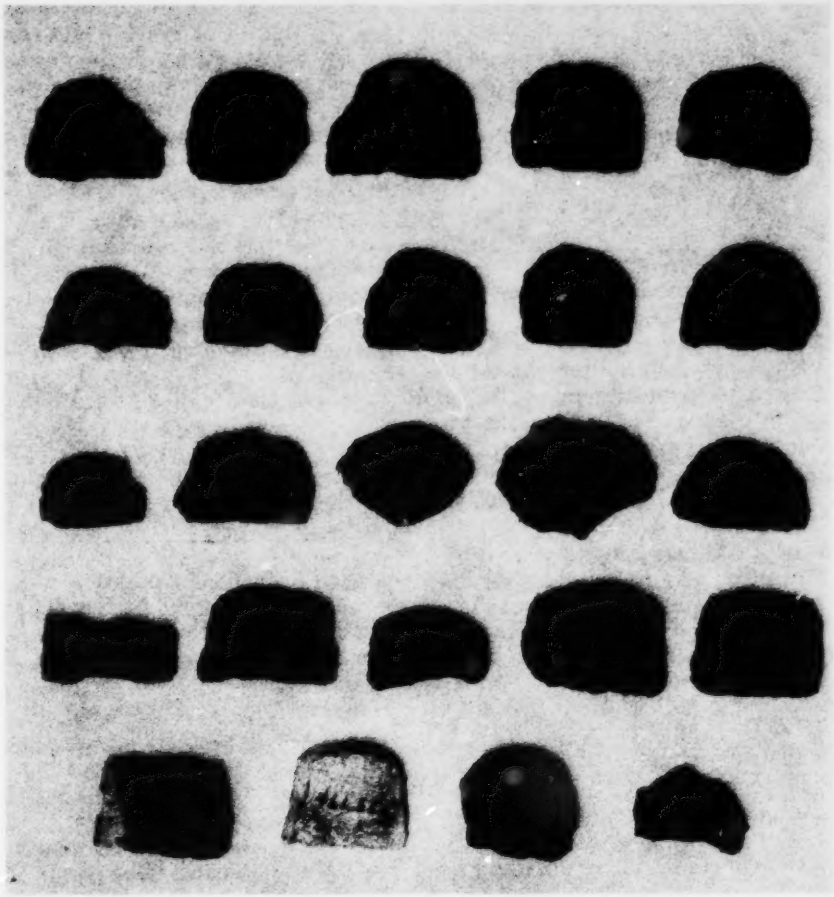
On Dutch Gunflints

Before Witthoft had announced his conclusions that the spall-type gunflints were made from flints taken from the Riss outwash in The Netherlands, the senior author pointed out that they appeared to fall into three distinct sub-types. Sub-type A was made from chert, and sub-type B "from a true flint which does not match any known samples from French or English quarries." Sub-type C can be "matched with conventional gunflints or flint samples from known quarries" (Hamilton 1964: 53). Now that Witthoft has identified certain flints as conforming to those coming from the Riss outwash, we are satisfied that some of sub-type A

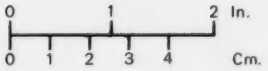
10 Flints from the Lartigue property.

and the majority of sub-type B come from that source, but we cannot agree with him that all of the so-called Dutch gunflints had their origin, in fact, in The Netherlands (Witthoft 1966: 26).

At the time the senior author wrote his 1964 paper, he had seen only two chert gunflints made in the Dutch style; one was in the museum collection of the Nebraska State Historical Society, a surface find, and the other was from a small sample of gunflints from Fort Frederica, St. Simons Island, Georgia (Fig. 8). Later, he read that Charles H. Fairbanks had concluded from the chips found on the parade near the guardroom door, that gunflints had been made at Fort Frederica (Manucy 1962: 81). While making a survey on trade guns for the Museum of the Great Plains, he consulted with Mr. Albert Manucy in St. Augustine, Florida, on this specific question, since this presented the first promising evidence that gunflints had actually been knapped in the Americas by Europeans. In the course of the conversation, Manucy presented the senior author with a nodule of flint, evidently brought over from England as ballast, from the surface of which spalls had been systematically struck. Manucy stated that he had brought this nodule with him from Fort Frederica when writing his report, but that he unfortunately did not have any of the gunflints in question. This nodule measures approximately five by three inches, is of a common grey-



10



ish flint, and still bears the chalk cortex—evidence of its European origin—on perhaps one-sixth of its surface. The spalls were apparently struck at random wherever a likely striking platform chanced to present itself as the work progressed. This nodule is shown in Figure 8 *a, b.*

The senior author then consulted W. H. Glover and Ross Hopkins at Fort Frederica. Mr. Hopkins generously spent his entire day going over what material they still had on hand and answering questions. Unfortunately, no nodules similar to that donated by Manucy could be found. Most of their flint material is now in storage at Ocmulgee National Monument, Macon, Georgia, and should include some of the used nodules as well as the majority of their gunflints. However, there were still enough gunflints present to prove that they had been struck from nodules of the same type of flint as the sample. Furthermore, several of these Dutch gunflints still bore traces of the chalk cortex, which further strengthens the relationship since Witthoft observes that none of those from The Netherlands shows "any trace of the cortex of an outcrop-nodule" (Witthoft 1966: 25). There can be no question that these specific Dutch gunflints were struck from nodules with a chalk cortex, so the burden of proving that they were not made at Fort Frederica must now rest upon anyone still maintaining that Dutch gunflints were made only in The Netherlands from nodules found in the Riss outwash. From the above evidence the authors feel that the origin of sub-type B (spall gunflints made from mined flint of unknown origin) is still unanswered and a visit to the Ocmulgee flint repository is long overdue.

As Witthoft so ably points out, the identification of the source of flint artifacts is extremely risky. At the present stage of our knowledge we must depend upon megascopic analysis which leaves plenty of room for disagreement between equally objective individuals. However, we are firmly convinced that sub-type C (spall gunflints which can be matched with conventional gunflints or flint from known quarries) is indeed a distinct variety of gunflint. In fact, the senior author found many sub-type C Dutch gunflints in the material sent him for study by Father René Lévesque of Laval University, Quebec, from his excavations at Sept-Iles and Mingan (Hamilton 1970). Therefore, it is the senior author's opinion at this time that the term "Dutch" should be used with reservation; that it should refer to a style of manufacture rather than to its source, and that until conclusively proven otherwise, its three sub-types should always be kept in mind.

On Fireflints and Firemaking

Witthoft makes two observations which clearly concern us when examining the gunflints from Louisbourg. He comments that "Early French gunflint blades were knapped into comparatively long sections, which were finished into wide flints. Perhaps the sectioning technique was not yet perfected, and the narrow segments were difficult to make. At any rate, most older French flints were too wide to fit the usual gunlocks of that time and were only adaptable to firemaking and to the massive locks of military muskets." Approximately one-third of these early French flints, according to Witthoft, had "concave edges shaped by use against the firesteel. Prior to 1760, French flints were designed more for firemaking, Dutch flints more for guns. However, many Dutch flints also show use against the firesteel" (Witthoft 1966: 28).

The problem of the wide, or what we in deference to the old French specifications call the "long", flints will be discussed later, but first we must clearly establish what is meant by the term "fireflint."

The only way to recognize the subtle difference between an 18th-century fireflint and a gunflint which has broken against the frizzen is to assemble a fire kit and master the technique of striking a fire. It will be quickly found that there is only one effective stroke—a straight strike from the edge of the flint toward the tinder—which produces the best shower of sparks. As a consequence, the tyro will soon produce a fireflint indistinguishable from those found on historic sites. By examining such a fireflint with the aid of a magnifying glass of moderate power the following observations can be made:

1) A used fireflint has concave edges, sides or back, depending upon the particular area used in striking.

It is impossible, using a firesteel, to maintain a straight edge on the flint.
2) In seeking the best shower of sparks there is a tendency to turn the flint over from time to time to get a sharper edge. This results in a bifacial striking edge.
3) In forming the concave bifacial striking edge only a few large flakes are removed, and those are incidental. Instead, many minute flakes are removed by the firesteel, giving the striking edge a sort of mottled appearance.

It follows, therefore, that a flint with a concave edge and large flakes but lacking the minute flake scars is a broken gunflint in which the concave edge broke out against the frizzen. Figure 5.*c* is an example of such a broken gunflint.

A fireflint can be any flint used with a steel to make fire, but a used gunflint, even though it shows extensive use against a firesteel, is still a gunflint. For instance, gunflints are often found with concave edges, possibly not as exaggerated as in Figure 5.*c*, but still suggesting a fireflint. An examination of the face shows that it has been used with a firesteel, but the larger flakes are still sharp enough to indicate that it first splintered against the frizzen and was only later used for making fire. A good, common-sense rule is that unless the signs are positive that it was used against a firesteel *exclusively*, then it is a gunflint.

An 18th-century fireflint should be defined as an object which in size and shape is in marked contrast to known gunflints of that period and whose use marks show that that object was used exclusively with a firesteel.

We have gone to such lengths concerning the exact meaning of the term fireflint so it will be clearly understood why we insist that all of the French flints from both Battery Island and from within Louisbourg proper are gunflints and that none of them are true fireflints. In the illustrations, it is true, several fireflints are identified, but this is based upon use marks only, so by the definition above not a single example would qualify as a fireflint.

The only true fireflints identified are two flakes of greyish chert, included with the gunflints (17L12D1 and 17L2A2, shown in Fig. 9.*c,d*). Since the material is definitely chert and has a pebble rind, it is assumed to be native to the area and not an import.

We might add that ordinary chert flakes, such as normally found on any Indian village site, make excellent fireflints, throwing as hot a shower of sparks as any high quality French flint. For this reason, as well as that discarded gunflints could be had for the mere effort of picking them up from the ground, we question whether there was enough demand on the 18th-century frontier for true fireflints to justify the cost of importation.

On the Width of Early French Gunflints

As noted at the beginning of the discussion on fireflints and fire-making, Witthoft commented on the tendency of early French flints to be too "wide" to fit the usual gun locks of that time, and suggested that the "sectioning technique was not yet perfected" (Witthoft 1966: 28). This is indeed one of the most puzzling characteristics of the gunflints of this period, but, as will be apparent from tables 3 and 4, it was not confined exclusively to the gunflints of French origin. Some of the largest gunflints yet found at Louisbourg are made in the Dutch style.

The facts are that the French military locks in use during the first half of the 18th century were not as large as the gunflints of that period suggest. Furthermore, during that period there was little difference in size between the frizzens and cocks used on French wall guns and muskets (Boudriot 1963: Cr. 10, Pl. 3). It follows that there was no such thing as a distinct size made for the rampart or wall gun and still another for the musket: both took the same size. This holds true particularly for the time during which the Fortress of Louisbourg was in being.

To be specific, the following tabulation shows the greatest width of the top jaw of the cock and the width of the frizzen on the various models of French muskets which are likely to have seen service at Louisbourg (Neumann 1969: personal communication).

Table 3: Jaw and Frizzen Widths on Various French Arms

Year of Model	Upper Vise Jaw (mm.)	Frizzen (14 mm. from tip) (mm.)
About 1690	30	30
Model 1717	30	30
Model 1728	28	26
Model 1746	28	26
Model 1754	27	30

Frizzen widths on other French weapons of the period are as follows (Gordon 1969: personal communication):

Pistol, 1640	17 mm.
Fusil, 1733	20 mm.
Pistol, 1733	23 mm.

On the Pseudo-Dutch Gunflints

Skertchly (1879: 41, 77), who spent much time studying the English knappers and acquired proficiency in the trade himself, throws some light on the question of the pseudo-Dutch gunflints found in the Battery Island cache.

He makes the following observation:

The flakes from which the arrowheads and some other implements were made had a single back, that is, one rib running down the centre of the back... Now these flakes were struck with a round or ovoid pebble ...The old English gunflints were also made from single-backed flakes, or from flakes which had no ribs whatever, and these were struck with an oval hammer. The backless English flakes and many of the single-backed ones, are still struck with the ovoid English hammer (Skertchly 1879: 41).

In Skertchly's Figure 58 he illustrates an "Old English Gun-Flint." There is no indication of exactly what he meant by the term "old" but the gunflint shown is exactly like many of the gunflints found in the Battery Island assemblage which we have called "pseudo-Dutch." In no place, however, can we find any reference to the colour of these "Old English" gunflints, so presumably they were made either from black or greyish-black flint, which are the only English flint colours mentioned by him. Neither of these colours would apply to the pseudo-Dutch which are, instead, somewhere between the colours of honey and brown sugar in hue. Therefore, we do not believe that the pseudo-Dutch are actually old English gunflints, though Skertchly may explain how they were made. For our part, we do not see how an ovoid hammer would necessarily strike off a ribless flake: it would seem that that would depend more upon the shape of the previous flake scars and the spot chosen for striking with the hammer than anything else.

Conclusions

Since two dissimilar aggregations of gunflints have been described, it would be best to present separately specific conclusions on the two lots.

The Battery Island Gunflints

Taken as a whole, the gunflints found on Battery Island are not typical of those from the second quarter of the 18th century. Of the 541 measurable flints, standard French gunflints compose less than 9 per cent of the total. On the other hand, chalk-heels, which are seldom seen in what may be called "normal" collections of French gunflints, represent 26 per cent. The peculiar pseudo-Dutch flints found among both the chalk-heels and the regular flints are, to our knowledge at least, a completely new variety, while the almost total absence of Dutch style gunflints has never before been observed by us in a mid-18th century context.

Just how this remarkable assembly of low quality gunflints ever got to such an important location as Louisbourg, as well as why they are almost exclusively confined to the precincts of Battery Island, are intriguing questions which we are in no position to answer. In this connection, the references to Louisbourg gunflints in correspondence during the years 1740, 1741 and 1745 are of interest. Can the "quantity of some thousands which are condemned," mentioned by Bigot in his letter of 5 December 1740, be represented today by the Battery Island gunflint cache?

It seems that the following conclusions can be drawn:

1) That this collection represents used French gunflints.

2) That they were used sometime between the completion of the fortification of Battery Island in 1734 and its abandonment after 1758.

3) That when these gunflints were bought (*a*) neither the procurement officer nor the supplier observed even rudimentary standards of quality, or (*b*) the art of making French style gunflints was in a rudimentary stage.
4) The four regular Dutch flints offer too small a sample upon which to base any conclusions.
5) The two peculiar gunflints with bulbs of percussion and conchoidal faces (Figs. 4,*d*; 5,*e*) may or may not represent abnormal Dutch-style flints. The only definite statement which can be made at this time is that the flint from which they are both made is indistinguishable from many of the French-style gunflints found on the island.

The Gunflints from within Louisbourg
So far as we can see, based upon our own observations and experience (Hamilton 1964: 52-7), the gunflints from within the fortress are about what one would expect in a site of this type and age. Unlike Witthoft, we have continued to feel that his original estimate (Hamilton 1960: 74) of a one to one ratio for French and Dutch gunflints at the time of the French and Indian War was approximately correct. The word "approximate" must be emphasized for there are bound to be variations in this ratio from site to site, not the least of which is the specific time bracket within which it was occupied; but if a sizeable military campsite occupied only during the 1750s could be isolated, we believe the count would show about 50 per cent French and 50 per cent Dutch. Though we believe that French flints were in the American trade before 1700, they did not become a significant factor until an as yet undetermined later date. Also, we suspect that French flints were used in quantity first by the French military, and only later by what may be termed the civilian population, including the fur traders and Indians. Therefore, in contrast to the hypothetical French military site of the 1750s, we would expect an Indian site of the same period to produce a greater proportion of Dutch than French gunflints, although the French flints should definitely be present.

The situation at Louisbourg is, of course, more complex. It was occupied by the French from 1713 to 1758, with a four-year New England and British occupation (1745-49), and a British occupation from 1758 until 1768. Our hypothesis concerning Louisbourg is that at the time of its founding, the French gunflints present were insignificant in number, but that their introduction in quantity began sometime during the 1730s, perhaps around 1735. We base this assumption primarily upon the French gunflint contract of 1740. Like all innovations, it took time for the new flints to gain acceptance. Presumably they did not supplant the Dutch style immediately, but more and more French flints were introduced, until by the time of the final capitulation enough French flints had arrived to bring the over-all ratio of French to Dutch flints to 1:2.4.

Unlike the material from Battery Island, the French gunflints from within Louisbourg proper appear to be the product of an established and mature industry. The flint from which they are made is of an excellent quality, and the flaking and knapping is expertly done. There is nothing to indicate that the men who made these gunflints could not have easily complied with any reasonable specifications as to length or width contained in any contract with French procurement officers.

The contract of 1740 is the only standard for comparison known at this time, and it specified that the length for musket flints should fall approximately between 34 mm. and 36 mm. Only 34 per cent of the Battery Island gunflints and 30 per cent of the Louisbourg French flints comply with those dimensions. It appears, therefore, that for some reason no attempt was made to enforce compliance and it is doubtful whether specific gunflints were made to fit specific weapons: if the gunflint could be squeezed between the jaws of the cock, it was used.

In this respect it is interesting to note that the Dutch gunflints conform more nearly to our 20th-century conception of how a flint should fit the frizzen, for 65 per cent of them are less than 34 mm. long, while only 39 per cent and 41 per cent of the French flints from Battery Island and Louisbourg respectively, fit in that category. This difference must have some significance since the percentages of French flints from Battery Island and from within the fortress are similar in each of the three categories listed in the table below:

Table 4: Frequency of French and Dutch Gunflints in Different Size Groupings

	Less than 34 mm. (%)	34 mm.-36 mm. (%)	Over 36 mm. (%)
Battery Island, French	39	34	27
Louisbourg, French	41	30	29
Louisbourg, Dutch	65	18	17

The fact that no Nordic or English gunflints have been found so far on Battery Island or within Louisbourg is worth noting. According to Witthoft, neither of these types should be present on a site occupied from 1720 to 1758, and their absence lends credence to his over-all thesis.

On the other hand, practically none of the French flints shows evidence of having been used exclusively as fireflints, and the one or two which do, are indistinguishable from the other gunflints in form: they are simply ordinary gunflints which happened to be used only for firemaking purposes. In short, the French flints from Battery Island and from within Louisbourg are indisputably gunflints and not fireflints. There is nothing here to support the supposition that French flints before 1760 were primarily intended for fire-making.

Appendix A: Dimensions of French Gunflints

[The following has been taken from a memorandum accompanying a letter dated 30 May 1968 from M. Jean Emy, Director of the *Musée de la Pierre à Fusil*, Meusnes (Loir-et-Cher), France, addressed to T. M. Hamilton. Since M. Emy includes information on gunflint specifications to the close of the flint-lock era this will be found useful to archaeologists working on sites later than Louisbourg. The translation was provided by Dr. Donald Baird, Princeton University.]

In 1740, for the first time, a contract for gunflints specifies dimensions:

	(lignes)	(mm.)
Length about	15-16	33.8-36
Width	14-15	31.6-33.8
Bevel (chamfer)	8- 9	18.0-20.3
Diameter (thickness)	4- 5	9.0-11.8

In a memorandum by Director of Artillery Labadie, dated "25 Messidor, An 5" [13 July 1797], the following dimensions are specified:

	Length *(lignes)*	Width *(lignes)*
Musket	15	11
Large pistol	10	8
Small pistol	8	8
Rampart gun	18	14

But as the knappers did not always furnish flints with dimensions coinciding with the specifications, it was necessary to establish a new norm for dimensions as follows:

	Length *(lignes)*	Width *(lignes)*
Musket	14	12
Large pistol	11	9
Small pistol	9	7
Rampart guns	17	15

On "16 Messidor, An 7" [5 July 1799] Monsieur Marechal, accountant at Meusnes, gave the following list and dimensions which seem to be the only varieties manufactured at that time. The "Fine heavy-duty" were those used in the army muskets.

	Length *(lignes)*	Width *(lignes)*
First Quality		
Cannon:		
Rampart gun pallets	16	16
Musket:		
Large fine	13	13
Fine heavy-duty	12	11
Sporting:		
Fine square [*carrés*]	8	8
Fine long	10	8
Pistol:		
Large pistol	6	6
Small pistol	4	4
Second Quality		
Buccaneer [trade gun]	13	13
Small belle	10	10

We may note that these flints were just about equal in length and width at that period...

In 1806 H. Cotty gives a list in which the dimensions are given in *lignes* and [millimetres]...

	(mm.)	*(lignes)*
Musket		
Length	29.3-31.6	13-14
Width	27.1-29.3	12-13
Thickness	6.8- 7.9	3-3½
Sharpened to [bevel]	13.5	6
Cavalry pistol		
Length	22.6-24.8	10-11
Width	22.6-24.8	10-11
Thickness	5.6- 6.8	2½-3
Sharpened to [bevel]	8.4	4

In 1808 a report by Saint-Aignan gives similar dimensions except for the bevel, where the tolerance is from 4 to 7 *lignes*... The dimensions specified in 1808 were retained until 1816 (Report of 20 May 1816 by the Colonel of Artillery of the Royal Factories).

Meanwhile Monsieur de Gribeauval had specified in tables the dimensions of gunflints; but experience having taught that it was extremely difficult to obtain them in these dimensions, the Committee on 28 August 1816 established new tolerances and had all the instruments of verification made in a precision workshop. The following are the dimensions proposed and then adopted:

		lignes
Musket:	Length	13-15
	Width	11-13
	Thickness at heel	3- 4
	Length of bevel	5-6½
Pistol:	Length	10-11
	Width	10-11
	Thickness at heel	2- 3
	Length of bevel	4- 5

On 6 August 1819, the Director General of the Royal Factories indicated that at the instigation of Colonel Cotty, the Minister of War had completed the foregoing table by adding to it the dimensions of flints for gendarmerie pistols:

	lignes
Length	8-9
Width	8-9½
Thickness at heel	2-2½
Length of bevel	3-4

In 1822 the foregoing dimensions were still accepted.

In 1831 a handbook for artillery officers gives dimensions in millimetres. They are just about the same, the conversion from *lignes* to millimetres having been rounded off. It is indicated that flints for musketoons were selected from among the smallest of those for muskets and the biggest of those for gendarmerie pistols. Flints for rampart guns were chosen from among the stoutest of the flints intended for infantry muskets.

In 1844 a handbook for artillery officers gives the same dimensions specifying that flints for musketoons and dragoon muskets were to be selected from the smallest for the infantry and the largest for cavalry pistols. At that date, however, flintlock arms had already been partly replaced by the percussion system.

As for the flints termed "civilian," the classification was established by eye and that evidently sufficed, for the customer could choose from among numerous models, each with a special name, those which were appropriate for his guns.

The dimensions that follow are taken from a collection of gunflints knapped in 1827, with their contemporary names. Having only a single flint of each of the type manufactured at that date, we cannot be sure that it represents the norm. Only the first, fourth, sixth and thirteenth models are termed "military." There are five models with two bevels indicated on the list. The others have rounded heels.

Beyond this we have found nothing that can provide precision; all the price lists of the merchants and commissionaires having been laid down without any indication of dimensions but merely with designations varying from one to another. Thus each purchaser, satisfied with a particular type of flint, probably stuck with it to the end. It was a case of habitual business method.

Dimensions of flints in 1827 (1 *ligne* = 2.25583 mm.)			
	Length (mm.)	Width (mm.)	Thickness (mm.)
*Musket or government	33	30	9
Belle, sporting	25	21	5
Belle, long-tailed, sporting	27.5	22	5
*Musketoon and carbine	25	24	6
Belle, square sporting	19	19	5
*Belle, horse pistol	20	20	5
Belle, large fine	30	29	8.5
Belle, large fine with 2 bevels	32	28	7.5
Rampart gun with 2 bevels	36	36	9
Large pistol	22	21.5	6
Large fine ordinary	30	29	9
Small fine with 2 bevels	24	24	5
*Rampart gun with rounded palette	40	39	10
Small fine ordinary	28	26	6
Buccaneer with 2 bevels	35	30	6
Buccaneer, rounded	33	30	7
Pocket pistol	19	17	5
"Double-barrel" for export, 2 bevels	34	29	9
Small belle	28	28	8.5

*Military flints

Primary Sources

France. Archives Nationales. Colonies.
B, Vol. 72, ff. 358-65, Minister of the Marine to DuQuesnel and Bigot, 17 May 1741.
B, Vol. 81, pp. 395-7, Bigot to Ricouart, 22 February 1745.
C^{11}B, Vol 22, ff. 82-83v, Bigot and DuQuesnel to Minister of Marine, 5 December 1740.

Secondary Sources

Boudriot, Jean
1963
Armes à feu françaises modèles règlementaires, 1717-1836. Series 2, Cahier 10, n.p., Paris.

Foster, Wayne
1965
"The Post-occupational History of the old French Town of Louisbourg (1760-1930)." Manuscript on file, National Historic Parks and Sites Branch, Louisbourg.

Fuller, Claude E.
1936
Springfield Shoulder Arms, 1795-1865. Frances Bannerman Sons, New York.

Hamilton, T. M.
1960
"Additional Comments on Gunflints." In: "Indian Trade Guns" (compiled and arranged by T. M. Hamilton), *Missouri Archaeologist*, Vol. 22 (December 1960), pp. 73-9. Columbia.
1963
"Recent Developments in the Use of Gunflints for Dating and Identification." In: *Diving into the Past: Theories, Techniques, and Applications of underwater Archaeology* (eds., J. D. Holmquist and A. H.) Wheeler), pp. 52-57, Minnesota Historical Society and the Council on Underwater Archaeology, Saint Paul.
1970
"The Gunflints of Sept-Iles and Mingan." *The Conference on Historic Site Archaeology Papers, 1969*, Vol. 4, Part 1, pp. 61-75. Columbia.

Larrabee, Edward McM.
1971
"Archaeological Research at the Fortress of Louisbourg, 1961-1965." *Canadian Historic Sites: Occasional Papers in Archaeology and History*, No. 2, pp. 8-43. Ottawa.

Lewis, Berkeley R.
1956
"Small Arms and Ammunition in the United States Service, 1775-1865." *Smithsonian Miscellaneous Collections*, Vol. 129. Washington, D.C.

Manucy, Albert C.
1962
"The Fort at Frederica." *Notes in Anthropology*, Vol. 5 (1962). Tallahassee.

McLennan, John Stewart
1957
Louisbourg from its Foundation to its Fall, 1713-1758. 2nd ed., Fortress Press, Sydney, Nova Scotia.

Skertchly, Sidney B. J.
1879
"On the Manufacture of Gun-flints, The Methods of Excavating for Flint, the Age of Paleolithic Man, and the Connexion Between Neolithic Art and the Gun-flint Trade." *Memoirs of the Geological Survey*, London.

Walker, Iain C.
1968
"Statistical Methods for Dating Clay Pipe Fragments." *Post-Medieval Archaeology*, Vol. 1 (1967), pp. 90-101. London.
1971
"An Archaeological Study of Clay Pipes from the King's Bastion, Fortress of Louisbourg." *Canadian Historic Sites, Occasional Papers in Archaeology and History*, No. 2, pp. 56-122. Ottawa.

Witthoft, John
1966
"A History of Gunflints." *Pennsylvania Archaeologist*, Vol. 36, Nos. 1 & 2 (January 1968), pp. 12-49. Gettysburg, PA.

Canadian Historic Sites: Occasional Papers in Archaeology and History

1 *Archaeological Investigations of the National Historic Sites Service, 1962-1966*, John H. Rick; *A Classification System for Glass Beads for the Use of Field Archaeologists*, K. E. and M. A. Kidd; *The Roma Settlement at Brudenell Point, Prince Edward Island*, Margaret Coleman. Reprinted 1974 $3.00

2 *Contributions from the Fortress of Louisbourg*—No. 1 *Archaeological Research at the Fortress of Louisbourg, 1961-1965*, Edward McM. Larrabee; *A "Rescue Excavation" at the Princess Half-bastion, Fortress of Louisbourg*, Bruce W. Fry; *An Archaeological Study of Clay Pipes from the King's Bastion, Fortress of Louisbourg*, Iain C. Walker. $3.00 Out of print

3 *Comparisons of the Faunal Remains from French and British Refuse Pits at Fort Michilimackinac: A study in Changing Subsistence Patterns*, Charles E. Cleland; *The French in Gaspé, 1534 to 1760*, David Lee; *The Armstrong Mound on Rainy River, Ontario*, Walter A. Kenyon. $3.00

4 *A Brief History of Lower Fort Garry*, Dale Miquelon; *The Big House, Lower Fort Garry*, George C. Ingram; *Industrial and Agricultural Activities at Lower Fort Garry*, George C. Ingram; *The Sixth Regiment of Foot at Lower Fort Garry*, William R. Morrison; *The Second Battalion, Quebec Rifles, at Lower Fort Garry*, William R. Morrison. $3.00 Out of print.

5 *Excavations at Lower Fort Garry, 1965-1967; A General Description of Excavations and Preliminary Discussions*, James V. Chism. $3.00

6 *A History of Rocky Mountain House*, Hugh A. Dempsey; *The Excavation and Historical Identification of Rocky Mountain House*, William C. Noble. $3.00

7 *Archaeological Investigations at Signal Hill, Newfoundland, 1965-66*, Edward B. Jelks. $3.00

8 *The Canals of Canada*, John P. Heisler. $5.00

9 *The Canadian Lighthouse*, Edward F. Bush; *Table Glass Excavated at Fort Amherst, Prince Edward Island*, Paul McNally; *Halifax Waterfront Buildings: An Historical Report*, Susan Buggey. $7.75

10 *The Architectural Heritage of the Rideau Corridor*, Barbara A. Humphreys; *Glassware Excavated at Fort Gaspereau, New Brunswick*, Jane E. Harris; *Commissioners of the Yukon, 1897-1918*, Edward F. Bush. $5.00

11 *The Battle of Queenston Heights*, Carol Whitfield; *A History of Fort George, Upper Canada*, Robert S. Allen; *The Battle of Châteauguay*, Victor J. H. Suthren. $5.00

12 *Contributions from the Fortress of Louisbourg*—No. 2 *Lime Preparation at 18th-Century Louisbourg*, Charles S. Lindsay; *Louisbourg Guardhouses*, Charles S. Lindsay; *A Survey of Louisbourg Gunflints*, T. M. Hamilton and Bruce W. Fry. $5.00

13 *All That Glitters: A Memorial to Ottawa's Capitol Theatre and its Predecessors*, Hilary Russell; *Glassware Excavated at Beaubassin, Nova Scotia*, Jane E. Harris; *Sir Sam Hughes (1853-1921)*, Carol Whitfield. In press

Available from Information Canada, Publishing Division, Ottawa, Ontario, K1A 0S9. Prices subject to change without notice. Additional charge is made for delivery outside Canada.

Articles appearing in this series are abstracted and indexed in *Historical Abstracts* and/or *America: History and Life.*

Canadian Historic Sites: Occasional Papers in Archaeology and History is also published in French under the title *Lieux historiques canadiens: Cahiers d'archéologie et d'histoire.* For more information, write Information Canada, Publications Division, 171 Slater Street, Ottawa, Ontario K1A 0S9, Canada.